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Research Article

Correlation and path analysis in F_2 generation of pumpkin (*Cucurbita moschata* Duch.ex Poir)

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Abstract
The present exploration was carried out with ten crosses in pumpkin including two check variety Co1 and Co2, sown in *Randomized Block Design (RBD)* without replication due to segregating population to determine the magnitude of association among yield and its contributing traits in pumpkin. Besides path analysis was carried out to determine the direct and indirect effects of correlation coefficients. Correlation studies concede that the traits number of fruits per vine, average fruit weight, fruit length, fruit diameter, flesh thickness, number of seeds per fruit and hundred seed weight exhibited strong significant and positive correlation towards fruit yield per plant. The character association confess that pre-eminent importance of number of fruits per vine, fruit length, fruit diameter decides the average fruit weight. Path analysis concludes that the number of fruits per vine and average fruit weight showed positive direct effect with fruit yield per plant. Hence the selection based on number of fruits per vine and average fruit weight may be valid for yield improvement in subsequent generations of pumpkin.

Key words
Pumpkin, Character association, correlation and path analysis, selection

Introduction

Pumpkins are the most important cucurbitaceous crop grown throughout the India and other warmer seasons of the world. The centre of origin for pumpkin is found to be Mexico and Peru, it is also distributed to both North and South America. The word Pumpkin (*Cucurbita moschata* Duch.ex Poir) originated from Greek word pepon which means large melon and pumpkins are a member of the cucurbita family which includes squash and cucumbers. It is a diploid and has chromosome number of 2n=40 (Whitaker and Robinson, 1986). Pumpkins is relatively high in energy and carbohydrates and a good source of vitamins especially high carotenoid pigments and minerals (Bose and Som, 1998). The nutrient per 100g edible portions of fruit is 90ml water, 8g carbohydrate, 1g protein, 0.5g fibres, 20mg calcium, 0.8mg iron, 210mg beta-carotene, 0.05mg thiamine, 0.05mg riboflavin, 0.52mg niacin and 15mg ascorbic acid (Tindall, 1987). Flowers are edible and once recommended for removing freckles and curing snake bites. Some of the value added products like halwa, jams and other sweets are prepared using ripened fruits of pumpkin. Pumpkin holds various nutrients in high content especially β-carotene and vitamin- E, which made the crop more and more attractive for health protection and it was used as a medicinal plant to cure many diseases since old times. Pumpkin contains cheaper source of vitamin A which is comparatively high than carrot and these crop requires specific climatic requirements however pumpkin grows in tropical conditions with limited cultural practices.

Materilas and Methods

The field experiments in pumpkin (*Cucurbita moschata* Duch.ex Poir) was carried out at the Orchard of the Department of Farm management, Agricultural college and Research Institute, Madurai during 2017-2018. The experimental site is located at an altitude of 158 m above MSL between 09º58´30.5´´N latitude, and 078º12´27.4E longitude. The area experiences a warm tropical climate and experimental field study has a sandy loam soil. The experiment was laid out in randomized block design without replication due to segregating population inF_2 generation. The F_2 generation had hundred plants in each cross and they are planted at a spacing of 2m x 2m.The ten crosses P_2 x P_5, P_2 x P_6, P_3 x P_5, P_3 x P_6, P_5 x P_2, P_5 x P_3, P_5 x P_6, P_6 x P_2, P_6 x P_3, P_6 x P_5 were evaluated in F_2 generation raised from July 2017 to November 2017 and all cultural practices are followed. The details and sources of crosses was given in the table 1. Hundred plants were evaluated in every cross on thirteen traits *viz.*, vine length, days to first male flowering, days to first female flowering, sex ratio, number of fruits per vine, days to first harvest, average fruit weight, fruit length, fruit diameter, flesh thickness, number of seeds per fruit, hundred seed weight, and fruit yield per plant. Correlation coefficients was estimated as suggested by (Al-Jibouri *et al.*, 1958). Path analysis was also

carried out by using correlation coefficients suggested by (Dewey and Lu, 1959).

Results and Discussion

The correlation coefficient may also help to identify characters that have little or no importance in selection programme. The existence of correlation may be attributed to the presence of the linkage or pleotropic effect of genes or the physiological and development relationship or the environmental effect or to a combination of all Johnson *et al.* (1955)

Correlation worked out in F_2 generations for thirteen traits in all crosses and the traits like number of fruits per vine, average fruit weight, fruit diameter, fruit length, flesh thickness, number of seeds per fruit and hundred seed weight exhibits positive and significant association with fruit yield per plant and similar results were reported by J. Kumar *et al.* (2005) and Kumaran *et al.* (1998) in pumpkin. On the other hand, in F_2 population days to first harvest exhibits negative and significant association with yield in the cross P_2 x P_6 and thus it reveals that yield can be improved by selecting the crosses with number of fruits per vine and average fruit weight. This indicated that fruit yield can be improved by making selections on the bases of these yield attributing characters. These finding are, in line with those of Husna *et al.* (2011) in and Kamal *et al.* (2012) in bottle gourd (Arunkumar *et al.* (2012); Hossain *et al.*, 2010; A. Kumar *et al.*, 2008), in cucumber and Blessing *et al.* (2012) in pumpkin.

Doku (1970) suggested that inter correlation among the yield components need to be estimated because one component influences the other related components. The inter correlation among these traits revealed significant and positive association for average fruit weight with fruit length, fruit diameter, flesh thickness and number of seeds per fruit in both the F_2 generation and similar results were reported by Taha *et al.* (2003) in muskmelon. However, number of fruits per vine had non-significant negative correlation with average fruit weight but it was significant positive correlation with fruit yield per plant. Though pre-eminence should be given during selection to the fruit length and fruit diameter for a higher weight and larger fruit size. In the ambience of consumer preference (1-2 kg fruit weight) and market demand (both domestic and export trade), fruit size and number of fruits per vine need to be balanced. Similar results was reported by Pandit *et al.* (2008) in bottlegourd.

Though correlation analysis indicates the association pattern of components traits with yield they simply represent the overall influence of a particular trait on yield rather than providing cause and effect relationship. The technique of path coefficient analysis facilitates the partitioning of correlation coefficients into direct and indirect contributions of various characters on yield. Such information would be of greater value in enabling the breeder to specifically identify the important component traits of yield and utilize the genetic stock for improvement in a planned way reported by Muttur *et al.* (2017) in pumpkin.

Path coefficient analysis revealed that the number of fruits per vine and average fruit weight exhibited maximum positive direct effect on the fruit yield in F_2 generation. The results were similar to the findings of Husna *et al.* (2011) in bottle gourd. The contributions of yield traits like number of fruits per vine and average fruit weight were high in the present study. Thus identified that for high yield the cross P_3 x P_5 can be selected which weigh bigger sized fruit, medium sized fruit cross P_2 x P_5 and for small fruit P_6 x P_5.

The characters like fruit length, fruit diameter, flesh thickness and hundred seed weight approaches positive indirect effect for fruit yield through average fruit weight. Indicates the fruit size influenced by these characters for bigger size fruits and small fruits. The low residual effects were recorded in the most the crosses in F_2 the generation indicates that all the important characters correlated with the fruit yield in pumpkin and this was verdict to the results of (Dey *et al.* (2009); Yadav *et al.*, 2013) in bitter gourd, (Husna *et al.*, 2011) in bottle gourd.

By these concluding that the crosses evaluated in F_2 generation possessed bizarre of traits in plant population. Among the ten crosses in F_2 generation, the crosses P_2 x P_5, P_2 x P_6, P_3 x P_5, P_3 x P_6, P_5 x P_2, P_5 x P_3, P_5 x P_6, P_6 x P_2, P_6 x P_3, P_6 x P_5 were evaluated. Among these population only four cross were selected P_2 x P_5 (P6, P15), P_3 x P_5 (P4, P23, P80), P_5 x P_6 (P43, P56) and P_6 x P_5 (P4, P10, P52), were found to be promising, better source population for exercising selection and these plants from the crosses were raised in F_3 generation which would be amenable for further selection.

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Table 1. Details of crosses, parents and their sources

S.No	Notation Cross/Parents	Parentage	Characters
1	P_2 x P_5	Ottanchathiram local x Attur local	Small fruited and early maturity
2.	P_2 x P_6	Ottanchathiram local x Acc. No. MDU CM31	Small fruited and early maturity
3.	P_3 x P_5	Harur local x Attur local	Small fruited, early maturity and high β-carotene content
4.	P_3 x P_6	Harur local x Acc. No. MDU CM31	Small fruited and early flowering
5.	P_5 x P_2	Attur local x Ottanchathiram local	Medium fruited and high TSS
6.	P_5 x P_3	Attur local x Harur local	Medium fruited and high TSS
7.	P_5 x P_6	Attur local x Acc. No. MDU CM31	Medium fruited, early flowering and high TSS
8.	P_6 x P_2	Acc.No. MDU CM31 x Ottanchathiram local	Medium fruited, high β- carotene content and narrow sex ratio
9.	P_6 x P_3	Acc. No. MDU CM31 x Harur local	Small fruited and early flowering
10.	P_6 x P_5	Acc. No. MDU CM31 x Attur local	Medium fruited and narrow sex ratio
11.	C1	Check variety, CO2 TNAU, Coimbatore	Medium seized fruit
12.	C2	Check variety, CO1 TNAU, Coimbatore	Big fruit and high yield

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Table 2. Correlation coefficients between fruit yield per plant and its yield components in the cross P_2 x P_5 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.029	-0.029	-0.077	-0.245*	0.074	0.425	0.234*	0.260	0.196	0.092	-0.019	0.172
Days to first male flowering		1	0.057	-0.050	0.045	-0.080	-0.075	-0.090	-0.275	-0.155	0.098	-0.146	0.118
Days to first female flowering			1	0.092	0.131	-0.068	-0.108	0.121	-0.020	0.003	-0.046	-0.089	0.003
Sex ratio				1	-0.059	-0.168	-0.007	-0.096	-0.036	0.013	-0.071	-0.206*	-0.094
Number of fruits per vine					1	0.080	-0.613	-0.261	0.003	-0.079	-0.283	-0.162	0.347**
Days to first harvest						1	-0.084	0.155	0.127	0.066	-0.170	0.086	0.032
Average fruit weight (kg)							1	0.463	0.290	0.385	0.281	0.088	0.475
Fruit length (cm)								1	0.173	0.347	0.221*	0.185	0.193
Fruit diameter (cm)									1	0.260	-0.014	0.033	0.363**
Flesh thickness (cm)										1	-0.023	0.104	0.422**
Number of seeds per fruit											1	0.237*	-0.007
Hundred seed weight (g)												1	-0.043

*Significant at 5 percent level
** Significant at 1 percent level

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Table 3. Correlation coefficients between fruit yield per plant and its yield components in the cross P_2 x P_6 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.008	-0.007	0.168	0.199*	-0.214*	0.117	0.018	-00.092	-0.174	-0.130	-0.071	0.193
Days to first male flowering		1	-0.148	0.360**	-00.104	0.062	0.166	0.011	0.245*	0.033	0.071	0.015	0.088
Days to first female flowering			1	-0.041	-0.072	-0.188	0.067	0.107	0.137	0.170	0.093	0.121	0.058
Sex ratio				1	-0.084	-0.020	0.180	0.072	0.197*	0.035	-0.049	-0.100	0.094
Number of fruits per vine					1	-0.033	-0.084	0.041	-0.117	-0.110	-0.083	-0.010	0.424**
Days to first harvest						1	-0.177	-0.189	-0.040	-0.091	0.076	-0.087	-0.207*
Average fruit weight (kg)							1	0.388**	0.311**	0.261**	0.161	0.184	0.839**
Fruit length (cm)								1	0.407**	0.278**	0.025	0.224*	0.388**
Fruit diameter (cm)									1	0.477**	0.171	0.107	0.216*
Flesh thickness (cm)										1	0.089	0.243*	0.188
Number of seeds per fruit											1	0.244*	0.104
Hundred seed weight (g)												1	0.192

*Significant at 5 percent level
** Significant at 1 percent level

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Table 4. Correlation coefficients between fruit yield per plant and its yield components in the cross P_3 x P_5 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.011	0.043	-0.018	-0.183	0.097	0.345**	0.069	0.058	-0.015	0.014	0.120	0.176
Days to first male flowering		1	0.036	0.016	0.032	-0.086	-0.042	-0.047	-0.059	-0.179	0.056	0.042	-0.009
Days to first female flowering			1	0.231*	-0.032	-0.028	0.026	0.015	-0.226*	-0.043	0.123	0.038	-0.029
Sex ratio				1	0.220*	-0.270**	-0.038	-0.005	-0.096	-0.147	0.044	-0.158	0.151
Number of fruits per vine					1	-0.436**	-0.222*	-0.150	0.052	-0.076	-0.056	0.027	0.504**
Days to first harvest						1	0.093	-0.037	-0.043	0.043	-0.012	0.039	-0.181
Average fruit weight (kg)							1	0.349**	0.312**	0.259**	0.057	0.081	0.705**
Fruit length (cm)								1	0.264**	0.103	0.199*	0.205*	0.239*
Fruit diameter (cm)									1	0.362**	-0.048	-0.026	0.323**
Flesh thickness (cm)										1	-0.079	-0.122	0.168
Number of seeds per fruit											1	0.260**	0.024
Hundred seed weight (g)												1	0.092

*Significant at 5 percent level
** Significant at 1 percent level

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Table 5. Correlation coefficients between fruit yield per plant and its yield components in the cross P_3 x P_6 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.066	-0.101	0.129	-0.095	-0.057	-0.052	0.064	0.093	0.026	-0.080	0.026	-0.120
Days to first male flowering		1	0.107	-0.062	0.034	0.001	-0.127	-0.093	0.011	0.221*	0.025	-0.069	-0.043
Days to first female flowering			1	0.123	-0.203*	-0.028	0.118	-0.100	-0.229*	-0.272**	-0.154	0.011	-0.067
Sex ratio				1	0.070	0.041	0.009	-0.006	-0.008	-0.067	-0.082	0.000	0.046
Number of fruits per vine					1	0.135	-0.160	-0.213*	-0.025	-0.115	0.132	-0.105	0.667**
Days to first harvest						1	0.067	0.116	-0.113	-0.002	0.027	-0.044	0.123
Average fruit weight (kg)							1	0.191	0.245*	0.129	0.268**	0.127	0.600**
Fruit length (cm)								1	0.464**	0.280**	0.100	0.300**	-0.040
Fruit diameter (cm)									1	0.448**	0.079	0.208*	0.148
Flesh thickness (cm)										1	0.140	-0.022	0.000
Number of seeds per fruit											1	-0.016	0.326**
Hundred seed weight (g)												1	0.000

*Significant at 5 percent level
** Significant at 1 percent level

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Table 6. Correlation coefficients between fruit yield per plant and its yield components in the cross P_5 x P_2 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.014	0.077	0.038	0.072	-0.034	0.148	-0.022	-0.162	-0.059	-0.127	-0.119	0.161
Days to first male flowering		1	-0.039	0.065	-0.004	0.145	-0.087	-0.012	0.078	-0.034	-0.027	-0.143	-0.026
Days to first female flowering			1	-0.019	-0.081	-0.186	-0.071	-0.151	-0.051	-0.145	-0.105	0	-0.143
Sex ratio				1	-0.002	-0.057	-0.084	0.168	-0.02	-0.122	0.162	0.043	-0.073
Number of fruits per vine					1	0.102	0.001	-0.008	0.176	0.041	0.048	-0.056	0.759**
Days to first harvest						1	0.054	0.047	-0.097	-0.022	-0.141	-0.081	0.119
Average fruit weight (kg)							1	0.012	0.259*	0.026	0.251*	0.158	0.627**
Fruit length (cm)								1	0.244*	0.297**	0.018	0.137	-0.035
Fruit diameter (cm)									1	0.501**	0.406**	0.243*	0.269**
Flesh thickness (cm)										1	0.201*	0.357**	0.009
Number of seeds per fruit											1	0.272**	0.161
Hundred seed weight (g)												1	0.019

*Significant at 5 percent level
** Significant at 1 percent level

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Table 7. Correlation coefficients between fruit yield per plant and its yield components in the cross P_5 x P_3 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.082	0.044	0.027	0.095	0.045	-0.026	0.033	-0.010	0.101	-0.047	-0.021	0.040
Days to first male flowering		1	-0.135	0.102	0.083	-0.138	0.167	0.195	0.095	-0.080	0.103	0.142	0.141
Days to first female flowering			1	0.020	0.120	0.104	0.142	-0.037	-0.004	0.103	-0.111	0.099	0.179
Sex ratio				1	-0.062	0.049	-0.100	-0.071	-0.133	-0.185	-0.220*	-0.190	-0.108
Number of fruits per vine					1	-0.172	0.213*	-0.013	0.120	0.182	-0.060	0.025	0.715**
Days to first harvest						1	-0.055	-0.036	-0.167	-0.027	-0.097	-0.029	-0.137
Average fruit weight (kg)							1	-0.162	0.429**	0.312**	0.205*	0.359**	0.810**
Fruit length (cm)								1	0.077	0.035	0.145	0.058	-0.129
Fruit diameter (cm)									1	0.442**	-0.049	0.156	0.370**
Flesh thickness (cm)										1	0.141	0.205*	0.314**
Number of seeds per fruit											1	0.394**	0.107
Hundred seed weight (g)												1	0.310**

*Significant at 5 percent level
** Significant at 1 percent level

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Table 8. Correlation coefficients between fruit yield per plant and its yield components in the cross P_5 x P_6 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.024	0.097	0.048	0.082	-0.044	0.158	-0.032	-0.172	-0.063	-0.137	-0.124	0.158
Days to first male flowering		1	-0.049	0.075	-0.004	0.155	-0.097	-0.012	0.088	-0.044	-0.024	-0.133	-0.027
Days to first female flowering			1	-0.017	-0.091	-0.196	-0.091	-0.141	-0.061	-0.155	-0.115	0.000	-0.152
Sex ratio				1	-0.002	-0.067	-0.094	0.158	-0.020	-0.122	0.142	0.053	-0.072
Number of fruits per vine					1	0.112	0.001	-0.008	0.186	0.037	0.038	-0.067	0.762**
Days to first harvest						1	0.054	0.037	-0.107	-0.026	-0.131	-0.078	0.128
Average fruit weight (kg)							1	0.022	0.249*	0.021	0.247*	0.167	0.617**
Fruit length (cm)								1	0.234*	0.284**	0.018	0.140	-0.045
Fruit diameter (cm)									1	0.499**	0.411**	0.253*	0.279**
Flesh thickness (cm)										1	0.198*	0.347**	0.009
Number of seeds per fruit											1	0.269**	0.171
Hundred seed weight (g)												1	0.021

*Significant at 5 percent level
** Significant at 1 percent level

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Table 9. Correlation coefficients between fruit yield per plant and its yield components in the cross P_6 x P_2 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.001	0.037	-0.071	0.130	0.064	0.156	-0.040	0.059	0.175	0.045	-0.079	0.163
Days to first male flowering		1	0.018	0.183	-0.054	-0.100	0.039	0.015	-0.071	-0.040	-0.091	-0.040	-0.037
Days to first female flowering			1	-0.033	0.004	0.044	-0.071	-0.041	-0.049	-0.014	0.015	0.180	-0.052
Sex ratio				1	0.085	-0.103	-0.147	-0.155	-0.196	-0.099	0.004	0.016	-0.084
Number of fruits per vine					1	0.027	0.105	-0.113	0.025	0.103	-0.042	0.031	0.501**
Days to first harvest						1	0.032	0.060	0.157	0.275**	0.281**	0.082	0.069
Average fruit weight (kg)							1	0.352**	0.569**	0.466**	0.237*	0.248*	0.889**
Fruit length (cm)								1	0.469**	0.330**	0.267**	0.323**	0.246*
Fruit diameter (cm)									1	0.583**	0.346**	0.323**	0.511**
Flesh thickness (cm)										1	0.450**	0.368**	0.469**
Number of seeds per fruit											1	0.536**	0.199*
Hundred seed weight (g)												1	0.242*

*Significant at 5 percent level
** Significant at 1 percent level

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Table 10. Correlation coefficients between fruit yield per plant and its yield components in the cross P_6 x P_3 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	-0.018	-0.074	0.019	0.167	0.038	-0.102	-0.114	-0.015	0.054	0.079	-0.042	0.040
Days to first male flowering		1	-0.055	0.071	-0.056	-0.073	-0.053	0.003	0.254*	0.039	-0.091	0.231*	-0.047
Days to first female flowering			1	-0.109	-0.048	-0.036	-0.134	-0.259**	-0.041	0.040	-0.016	-0.098	-0.158
Sex ratio				1	0.098	0.091	-0.037	-0.205*	-0.248*	-0.108	-0.017	-0.048	0.037
Number of fruits per vine					1	-0.009	0.008	-0.024	0.155	-0.004	0.127	-0.069	0.530**
Days to first harvest						1	0.080	-0.152	0.024	0.084	0.040	-0.079	0.028
Average fruit weight (kg)							1	0.334**	0.209*	0.156	0.286**	0.141	0.806**
Fruit length (cm)								1	0.390**	0.273**	0.329**	0.397**	0.281**
Fruit diameter (cm)									1	0.327**	0.286**	0.388**	0.279**
Flesh thickness (cm)										1	0.338**	0.071	0.146
Number of seeds per fruit											1	0.246*	0.312**
Hundred seed weight (g)												1	0.113

*Significant at 5 percent level
** Significant at 1 percent level

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Table 11. Correlation coefficients between fruit yield per plant and its yield components in the cross P_6 x P_5 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	1	0.028	-0.085	0.017	0.223*	0.083	-0.078	0.055	-0.072	0.080	0.014	0.012	0.158
Days to first male flowering		1	-0.085	0.014	-0.002	-0.042	-0.085	0.090	-0.037	-0.070	-0.039	-0.055	-0.068
Days to first female flowering			1	0.134	0.131	0.034	-0.138	-0.003	-0.161	-0.103	-0.080	-0.122	0.024
Sex ratio				1	-0.077	0.203*	-0.019	0.047	-0.114	-0.008	0.042	-0.050	-0.104
Number of fruits per vine					1	-0.069	-0.517**	0.019	-0.114	0.028	0.134	-0.082	0.505**
Days to first harvest						1	0.020	0.161	-0.052	-0.003	0.115	0.134	-0.073
Average fruit weight (kg)							1	0.084	0.340**	0.003	-0.034	0.096	0.444**
Fruit length (cm)								1	0.019	-0.041	0.138	0.119	0.110
Fruit diameter (cm)									1	0.306**	0.126	0.339**	0.193
Flesh thickness (cm)										1	-0.014	0.098	0.002
Number of seeds per fruit											1	0.421**	0.106
Hundred seed weight (g)												1	-0.027

*Significant at 5 percent level
** Significant at 1 percent level

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Table 12. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_2 x P_5 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**-0.0621**	-0.0018	-0.0005	0.003	-0.2426	0.0035	0.4726	-0.0255	0.0055	0.0202	0.0003	-0.0001	0.172
Days to first male flowering	-0.0018	**-0.0627**	0.0009	0.002	0.044	-0.0038	-0.0836	0.0098	-0.0058	-0.016	0.0003	-0.0011	0.118
Days to first female flowering	0.0018	-0.0036	**0.0166**	-0.0036	0.1291	-0.0032	-0.1204	-0.0132	-0.0004	0.0003	-0.0001	-0.0007	0.003
Sex ratio	0.0048	0.0032	0.0015	**-0.039**	-0.0582	-0.008	-0.0074	0.0105	-0.0008	0.0014	-0.0002	-0.0015	-0.094
Number of fruits per vine	0.0152	-0.0028	0.0022	0.0023	**0.9881**	0.0038	-0.6808	0.0285	0.0001	-0.0081	-0.0008	-0.0012	0.347**
Days to first harvest	-0.0046	0.005	-0.0011	0.0065	0.0794	**0.0476**	-0.0933	-0.0169	0.0027	0.0068	-0.0005	0.0006	0.032
Average fruit weight (kg)	-0.0264	0.0047	-0.0018	0.0003	-0.6055	-0.004	**1.1111**	-0.0506	0.0062	0.0397	0.0008	0.0006	0.475**
Fruit length (cm)	-0.0145	0.0056	0.002	0.0038	-0.258	0.0074	0.5147	**-0.1093**	0.0037	0.0358	0.0006	0.0014	0.193
Fruit diameter (cm)	-0.0162	0.0172	-0.0003	0.0014	0.003	0.006	0.3226	-0.0189	**0.0212**	0.0268	0.0000	0.0002	0.363**
Flesh thickness (cm)	-0.0122	0.0097	0.0001	-0.0005	-0.0776	0.0031	0.428	-0.0379	0.0055	**0.1031**	-0.0001	0.0008	0.422**
Number of seeds per fruit	-0.0057	-0.0062	-0.0008	0.0028	-0.2794	-0.0081	0.3126	-0.0241	-0.0003	-0.0024	**0.0028**	0.0017	-0.007
Hundred seed weight (g)	0.0012	0.0092	-0.0015	0.008	-0.1603	0.0041	0.0976	-0.0202	0.0007	0.0107	0.0007	**0.0073**	-0.043

Bold values refer to direct effects
Residual effect: 0.3129

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Table 13. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_2 x P_6 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**-0.0104**	0.0001	-0.0002	-0.003	0.0988	0.0062	0.1014	0.0004	0.0011	-0.0002	0.0002	-0.0018	0.193
Days to first male flowering	-0.0001	**0.0107**	-0.004	-0.0064	-0.0517	-0.0018	0.144	0.0003	-0.003	0.0000	-0.0001	0.0004	0.088
Days to first female flowering	0.0001	-0.0016	**0.0268**	0.0007	-0.036	0.0055	0.0585	0.0024	-0.0017	0.0002	-0.0002	0.003	0.058
Sex ratio	-0.0017	0.0038	-0.0011	**-0.0177**	-0.042	0.0006	0.1557	0.0017	-0.0024	0.0000	0.0001	-0.0025	0.094
Number of fruits per vine	-0.0021	-0.0011	-0.0019	0.0015	**0.4973**	0.001	-0.0732	0.0009	0.0014	-0.0001	0.0001	-0.0003	0.424**
Days to first harvest	0.0022	0.0007	-0.005	0.0004	-0.0166	**-0.029**	-0.1535	-0.0043	0.0005	-0.0001	-0.0001	-0.0022	-0.207*
Average fruit weight (kg)	-0.0012	0.0018	0.0018	-0.0032	-0.042	0.0051	**0.8671**	0.0089	-0.0038	0.0003	-0.0003	0.0046	0.839**
Fruit length (cm)	-0.0002	0.0001	0.0029	-0.0013	0.0201	0.0055	0.3367	**0.0229**	-0.005	0.0003	0.0000	0.0056	0.388**
Fruit diameter (cm)	0.001	0.0026	0.0037	-0.0035	-0.0584	0.0012	0.2694	0.0093	**-0.0122**	0.0005	-0.0003	0.0027	0.216*
Flesh thickness (cm)	0.0018	0.0004	0.0046	-0.0006	-0.0549	0.0026	0.2262	0.0064	-0.0058	**0.0011**	-0.0002	0.0061	0.188
Number of seeds per fruit	0.0013	0.0008	0.0025	0.0009	-0.0413	-0.0022	0.1396	0.0006	-0.0021	0.0001	**-0.0018**	0.0061	0.104
Hundred seed weight (g)	0.0007	0.0002	0.0032	0.0018	-0.0051	0.0025	0.1599	0.0051	-0.0013	0.0003	-0.0004	**0.025**	0.192

Bold values refer to direct effects
Residual effect: 0.2141

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Table 14. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_3 x P_5 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**0.0098**	0.0001	-0.0017	-0.001	-0.1309	0.0068	0.2882	0.0037	0.0006	0.0000	0.0001	-0.0003	0.176
Days to first male flowering	0.0001	**0.0128**	-0.0014	0.0008	0.023	-0.0061	-0.0348	-0.0026	-0.0006	-0.0005	0.0005	-0.0001	-0.009
Days to first female flowering	0.0004	0.0005	**-0.0383**	0.0124	-0.0226	-0.002	0.0213	0.0008	-0.0023	-0.0001	0.0011	-0.0001	-0.029
Sex ratio	-0.0002	0.0002	-0.0089	**0.0536**	0.1578	-0.0191	-0.0318	-0.0002	-0.001	-0.0004	0.0004	0.0004	0.151
Number of fruits per vine	-0.0018	0.0004	0.0012	0.0118	**0.7162**	-0.0308	-0.185	-0.0082	0.0005	-0.0002	-0.0005	-0.0001	0.504**
Days to first harvest	0.0009	-0.0011	0.0011	-0.0145	-0.3126	**0.0706**	0.0774	-0.002	-0.0004	0.0001	-0.0001	-0.0001	-0.181
Average fruit weight (kg)	0.0034	-0.0005	-0.001	-0.002	-0.1588	0.0065	**0.8341**	0.019	0.0032	0.0007	0.0005	-0.0002	0.705**
Fruit length (cm)	0.0007	-0.0006	-0.0006	-0.0002	-0.1074	-0.0026	0.2913	**0.0544**	0.0027	0.0003	0.0017	-0.0005	0.239*
Fruit diameter (cm)	0.0006	-0.0008	0.0087	-0.0052	0.0374	-0.003	0.2605	0.0143	**0.0101**	0.001	-0.0004	0.0001	0.323**
Flesh thickness (cm)	-0.0001	-0.0023	0.0016	-0.0079	-0.0543	0.003	0.2158	0.0056	0.0037	**0.0028**	-0.0007	0.0003	0.168
Number of seeds per fruit	0.0001	0.0007	-0.0047	0.0023	-0.0398	-0.0008	0.0475	0.0108	-0.0005	-0.0002	**0.0088**	-0.0006	0.024
Hundred seed weight (g)	0.0012	0.0005	-0.0015	-0.0085	0.0194	0.0028	0.0677	0.0112	-0.0003	-0.0003	0.0023	**-0.0025**	0.092

Bold values refer to direct effects
Residual effect: 0.1910

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Table 15. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_3 x P_6 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**-0.0054**	0.0015	-0.0002	-0.0014	-0.0748	0.002	-0.0378	0.0001	-0.0011	-0.0002	-0.0022	-0.0002	-0.120
Days to first male flowering	-0.0004	**0.0233**	0.0002	0.0007	0.0269	0.0000	-0.0926	-0.0002	-0.0001	-0.002	0.0007	0.0006	-0.043
Days to first female flowering	0.0005	0.0025	**0.0022**	-0.0013	-0.1587	0.001	0.0858	-0.0002	0.0027	0.0025	-0.0043	-0.0001	-0.067
Sex ratio	-0.0007	-0.0014	0.0003	**-0.0107**	0.055	-0.0014	0.0065	0.0000	0.0001	0.0006	-0.0023	0.0000	0.046
Number of fruits per vine	0.0005	0.0008	-0.0004	-0.0008	**0.7831**	-0.0048	-0.1167	-0.0004	0.0003	0.001	0.0037	0.0009	0.667**
Days to first harvest	0.0003	0.0000	-0.0001	-0.0004	0.1061	**-0.0351**	0.049	0.0002	0.0014	0.0000	0.0007	0.0004	0.123
Average fruit weight (kg)	0.0003	-0.003	0.0003	-0.0001	-0.1256	-0.0024	**0.7276**	0.0004	-0.0029	-0.0012	0.0075	-0.0011	0.600**
Fruit length (cm)	-0.0003	-0.0022	-0.0002	0.0001	-0.1664	-0.0041	0.1387	**0.0021**	-0.0056	-0.0025	0.0028	-0.0026	-0.040
Fruit diameter (cm)	-0.0005	0.0003	-0.0005	0.0001	-0.0193	0.004	0.1785	0.001	**-0.012**	-0.0041	0.0022	-0.0018	0.148
Flesh thickness (cm)	-0.0001	0.0051	-0.0006	0.0007	-0.0899	0.0001	0.0939	0.0006	-0.0054	**-0.0091**	0.0039	0.0002	0.000
Number of seeds per fruit	0.0004	0.0006	-0.0003	0.0009	0.1036	-0.0009	0.1953	0.0002	-0.0009	-0.0013	**0.0279**	0.0001	0.326**
Hundred seed weight (g)	-0.0001	-0.0016	0.0000	0.0000	-0.0824	0.0016	0.0927	0.0006	-0.0025	0.0002	-0.0005	**-0.0086**	0.000

Bold values refer to direct effects
Residual effect: 0.1976

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Table 16. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_5 x P_2 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**0.0088**	-0.0023	0.0003	0.0002	0.0544	-0.0001	-0.017	-0.0002	-0.0001	-0.002	0.0007	-0.0013	0.161
Days to first male flowering	0.0009	**-0.0292**	-0.0007	0.0006	0.0478	0.0007	0.1116	-0.0017	0.0017	0.0018	-0.0011	0.0096	-0.026
Days to first female flowering	0.0006	0.004	**0.0057**	0.0002	0.0687	-0.0003	0.0951	0.0004	0.0000	-0.002	0.0014	0.0067	-0.143
Sex ratio	0.0004	-0.0029	0.0002	**0.0054**	-0.0355	-0.0001	-0.0668	0.0007	-0.0022	0.0039	0.0028	-0.0126	-0.073
Number of fruits per vine	0.001	-0.0023	0.0008	-0.0002	**0.5723**	0.0008	0.1429	0.0002	0.0021	-0.0037	0.0008	0.0018	0.759**
Days to first harvest	0.0006	0.0041	0.0007	0.0004	-0.0981	**-0.004**	-0.0368	0.0004	-0.0027	0.0007	0.0013	-0.0018	0.119
Average fruit weight (kg)	0.0000	-0.0048	0.0009	-0.0004	0.1222	0.0003	**0.669**	0.0016	0.0074	-0.0064	-0.0024	0.0241	0.627**
Fruit length (cm)	0.0005	-0.0056	-0.0001	-0.0003	-0.0076	0.0002	-0.1085	**-0.009**	0.0014	-0.0006	-0.0017	0.004	-0.035
Fruit diameter (cm)	0.0001	-0.0027	0.0001	-0.0006	0.0686	0.0008	0.2869	-0.0006	**0.0171**	-0.0091	0.0007	0.0105	0.269**
Flesh thickness (cm)	0.0011	0.0025	0.0007	-0.0009	0.1043	0.0002	0.2089	-0.0002	0.0076	**-0.0207**	-0.0016	0.0138	0.009
Number of seeds per fruit	-0.0002	-0.0029	-0.0005	-0.0011	-0.0345	0.0005	0.1374	-0.0012	-0.0007	-0.0028	**-0.012**	0.0264	0.161
Hundred seed weight (g)	0.0000	-0.0041	0.0007	-0.0009	0.0145	0.0002	0.2406	-0.0004	0.0027	-0.0042	-0.0047	**0.0669**	0.019

Bold values refer to direct effects and other indirect effect
Residual effect: 0.1635

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Table 17. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_5 x P_3 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**0.0086**	-0.0024	0.0002	0.0001	0.0543	-0.0002	-0.0171	-0.0003	-0.0002	-0.0021	0.0006	-0.0014	0.040
Days to first male flowering	0.0007	**-0.0293**	-0.0008	0.0005	0.0477	0.0006	0.1115	-0.0018	0.0016	0.0017	-0.0012	0.0095	0.141
Days to first female flowering	0.0004	0.0039	**0.0056**	0.0001	0.0686	-0.0004	0.095	0.0003	-0.0001	-0.0021	0.0013	0.0066	0.179
Sex ratio	0.0002	-0.003	0.0001	**0.0053**	-0.0356	-0.0002	-0.0669	0.0006	-0.0023	0.0038	0.0027	-0.0127	-0.108
Number of fruits per vine	0.0008	-0.0024	0.0007	-0.0003	**0.5722**	0.0007	0.1428	0.0001	0.002	-0.0038	0.0007	0.0017	0.715**
Days to first harvest	0.0004	0.004	0.0006	0.0003	-0.0982	**-0.0041**	-0.0369	0.0003	-0.0028	0.0006	0.0012	-0.0019	-0.137
Average fruit weight (kg)	-0.0002	-0.0049	0.0008	-0.0005	0.1221	0.0002	**0.6689**	0.0015	0.0073	-0.0065	-0.0025	0.024	0.810**
Fruit length (cm)	0.0003	-0.0057	-0.0002	-0.0004	-0.0077	0.0001	-0.1086	**-0.0091**	0.0013	-0.0007	-0.0018	0.0039	-0.129
Fruit diameter (cm)	-0.0001	-0.0028	0.0000	-0.0007	0.0685	0.0007	0.2868	-0.0007	**0.017**	-0.0092	0.0006	0.0104	0.370**
Flesh thickness (cm)	0.0009	0.0024	0.0006	-0.001	0.1042	0.0001	0.2088	-0.0003	0.0075	**-0.0208**	-0.0017	0.0137	0.314**
Number of seeds per fruit	-0.0004	-0.003	-0.0006	-0.0012	-0.0346	0.0004	0.1373	-0.0013	-0.0008	-0.0029	**-0.0121**	0.0263	0.107
Hundred seed weight (g)	-0.0002	-0.0042	0.0006	-0.001	0.0144	0.0001	0.2405	-0.0005	0.0026	-0.0043	-0.0048	**0.0668**	0.310**

Bold values refer to direct effects
Residual effect: 0.1769

Table 18. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_5 x P_6 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**-0.0045**	0.0008	-0.0035	-0.0004	0.0621	0.0002	0.0983	0.0016	-0.0009	0.0012	0.0012	0.0017	0.158
Days to first male flowering	-0.0001	**0.0311**	0.0018	-0.0006	-0.0028	-0.0006	-0.0601	0.0006	0.0005	0.0009	0.0002	0.0018	-0.027
Days to first female flowering	-0.0004	-0.0015	**-0.0363**	0.0001	-0.0688	0.0008	-0.0566	0.0071	-0.0003	0.003	0.001	0.0000	-0.152
Sex ratio	-0.0002	0.0023	0.0006	**-0.0074**	-0.0017	0.0003	-0.0584	-0.008	-0.0001	0.0024	-0.0013	-0.0007	-0.072
Number of fruits per vine	-0.0004	-0.0001	0.0033	0.0000	**0.7578**	-0.0004	0.0009	0.0004	0.001	-0.0007	-0.0003	0.0009	0.762**
Days to first harvest	0.0002	0.0048	0.0071	0.0005	0.0852	**-0.004**	0.0337	-0.0019	-0.0006	0.0005	0.0012	0.001	0.128
Average fruit weight (kg)	-0.0007	-0.003	0.0033	0.0007	0.0011	-0.0002	**0.6205**	-0.0011	0.0014	-0.0004	-0.0022	-0.0023	0.617**
Fruit length (cm)	0.0001	-0.0004	0.0051	-0.0012	-0.0059	-0.0001	0.0138	**-0.0506**	0.0013	-0.0056	-0.0002	-0.0019	-0.045
Fruit diameter (cm)	0.0008	0.0027	0.0022	0.0001	0.1412	0.0004	0.1542	-0.0118	**0.0055**	-0.0098	-0.0037	-0.0034	0.279**
Flesh thickness (cm)	0.0003	-0.0014	0.0056	0.0009	0.0279	0.0001	0.0128	-0.0144	0.0027	**-0.0196**	-0.0018	-0.0047	0.009
Number of seeds per fruit	0.0006	-0.0008	0.0042	-0.0011	0.0292	0.0005	0.1535	-0.0009	0.0022	-0.0039	**-0.0089**	-0.0036	0.171
Hundred seed weight (g)	0.0006	-0.0041	0.0000	-0.0004	-0.051	0.0003	0.1038	-0.0071	0.0014	-0.0068	-0.0024	**-0.0135**	0.021

Bold values refer to direct effects
Residual effect: 0.1835

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Table 19. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_6 x P_2 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**-0.0279**	-0.0001	0.0002	-0.0011	0.0528	0.0013	0.1309	0.0008	0.0007	0.0066	-0.0006	-0.0008	0.163
Days to first male flowering	0.0000	**-0.0466**	0.0001	0.0029	-0.0219	-0.0021	0.0323	-0.0003	-0.0008	-0.0015	0.0012	-0.0004	-0.037
Days to first female flowering	-0.001	-0.0008	**0.0064**	-0.0005	0.0014	0.0009	-0.0597	0.0008	-0.0005	-0.0005	-0.0002	0.0019	-0.052
Sex ratio	0.002	-0.0085	-0.0002	**0.016**	0.0346	-0.0022	-0.1229	0.0031	-0.0022	-0.0037	-0.0001	0.0002	-0.084
Number of fruits per vine	-0.0036	0.0025	0.0000	0.0014	**0.4046**	0.0006	0.0879	0.0022	0.0003	0.0039	0.0006	0.0003	0.501**
Days to first harvest	-0.0018	0.0047	0.0003	-0.0016	0.011	**0.021**	0.0271	-0.0012	0.0018	0.0103	-0.0037	0.0009	0.069
Average fruit weight (kg)	-0.0044	-0.0018	-0.0005	-0.0023	0.0424	0.0007	**0.8382**	-0.007	0.0063	0.0175	-0.0031	0.0026	0.889**
Fruit length (cm)	0.0011	-0.0007	-0.0003	-0.0025	-0.0456	0.0013	0.2951	**-0.0198**	0.0052	0.0124	-0.0035	0.0034	0.246*
Fruit diameter (cm)	-0.0016	0.0033	-0.0003	-0.0031	0.0099	0.0033	0.4769	-0.0093	**0.0111**	0.0219	-0.0046	0.0034	0.511**
Flesh thickness (cm)	-0.0049	0.0019	-0.0001	-0.0016	0.0416	0.0058	0.3908	-0.0065	0.0065	**0.0375**	-0.0059	0.0039	0.469**
Number of seeds per fruit	-0.0013	0.0042	0.0001	0.0001	-0.017	0.0059	0.1989	-0.0053	0.0039	0.0169	**-0.0132**	0.0056	0.199*
Hundred seed weight (g)	0.0022	0.0019	0.0011	0.0003	0.0126	0.0017	0.2076	-0.0064	0.0036	0.0138	-0.0071	**0.0105**	0.242*

Bold values refer to direct effects
Residual effect: 0.1931

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Table 20. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_6 x P_3 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**0.0361**	-0.0002	0.0014	0.0005	0.0855	-0.0013	-0.0811	-0.0005	-0.0003	0.0009	0.0000	-0.0009	0.040
Days to first male flowering	-0.0007	**0.0084**	0.001	0.0018	-0.0286	0.0025	-0.0424	0.0000	0.0058	0.0007	0.0000	0.0048	-0.047
Days to first female flowering	-0.0027	-0.0005	**-0.019**	-0.0028	-0.0244	0.0012	-0.1067	-0.0012	-0.0009	0.0007	0.0000	-0.002	-0.158
Sex ratio	0.0007	0.0006	0.0021	**0.0253**	0.0502	-0.0031	-0.0296	-0.0009	-0.0057	-0.0019	0.0000	-0.001	0.037
Number of fruits per vine	0.006	-0.0005	0.0009	0.0025	**0.5119**	0.0003	0.0066	-0.0001	0.0035	-0.0001	0.0000	-0.0014	0.530**
Days to first harvest	0.0014	-0.0006	0.0007	0.0023	-0.0047	**-0.0342**	0.0638	-0.0007	0.0005	0.0014	0.0000	-0.0017	0.028
Average fruit weight (kg)	-0.0037	-0.0004	0.0025	-0.0009	0.0042	-0.0027	**0.7954**	0.0015	0.0048	0.0027	-0.0001	0.0029	0.806**
Fruit length (cm)	-0.0041	0.0000	0.0049	-0.0052	-0.0125	0.0052	0.2659	**0.0045**	0.0089	0.0047	-0.0001	0.0082	0.281**
Fruit diameter (cm)	-0.0005	0.0021	0.0008	-0.0063	0.0792	-0.0008	0.1666	0.0018	**0.0229**	0.0056	-0.0001	0.0081	0.279**
Flesh thickness (cm)	0.0019	0.0003	-0.0008	-0.0027	-0.0019	-0.0029	0.1244	0.0012	0.0075	**0.0171**	-0.0001	0.0015	0.146
Number of seeds per fruit	0.0029	-0.0008	0.0003	-0.0004	0.0648	-0.0014	0.2277	0.0015	0.0066	0.0058	**-0.0002**	0.0051	0.312**
Hundred seed weight (g)	-0.0015	0.0019	0.0019	-0.0012	-0.0351	0.0027	0.1121	0.0018	0.0089	0.0012	-0.0001	**0.0208**	0.113

Bold values refer to direct effects
Residual effect: 0.2668

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Table 21. Direct and indirect effects in fruit yield and partitioned by path analysis in the cross P_6 x P_5 of pumpkin.

Characters	Vine length	Day to first male flowering	Day to first female flowering	Sex ratio	Number of fruits per vine	Days to first harvest	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	Number of seeds per fruit	Hundred seed weight	Fruit yield per plant
Vine length (m)	**0.0183**	0.0004	-0.0024	-0.0002	0.22	-0.0018	-0.0755	0.0007	0.0002	-0.0017	0.0004	-0.0005	0.158
Days to first male flowering	0.0005	**0.013**	-0.0024	-0.0002	-0.0017	0.0009	-0.0824	0.0011	0.0001	0.0015	-0.0011	0.0024	-0.068
Days to first female flowering	-0.0016	-0.0011	**0.0278**	-0.0019	0.1296	-0.0008	-0.1332	0.0000	0.0004	0.0021	-0.0024	0.0053	0.024
Sex ratio	0.0003	0.0002	0.0037	**-0.0145**	-0.0758	-0.0045	-0.0181	0.0006	0.0003	0.0002	0.0012	0.0022	-0.104
Number of fruits per vine	0.0041	0.0000	0.0037	0.0011	**0.9872**	0.0015	-0.4996	0.0002	0.0003	-0.0006	0.0039	0.0036	0.505**
Days to first harvest	0.0015	-0.0005	0.0009	-0.0029	-0.0685	**-0.0222**	0.0195	0.002	0.0001	0.0001	0.0034	-0.0059	-0.073
Average fruit weight (kg)	-0.0014	-0.0011	-0.0038	0.0003	-0.5107	-0.0004	**0.9657**	0.0011	-0.0008	-0.0001	-0.001	-0.0042	0.444**
Fruit length (cm)	0.001	0.0012	-0.0001	-0.0007	0.0192	-0.0036	0.0811	**0.0125**	0.0000	0.0008	0.0041	-0.0052	0.110
Fruit diameter (cm)	-0.0013	-0.0005	-0.0045	0.0017	-0.1125	0.0012	0.3288	0.0002	**-0.0022**	-0.0064	0.0037	-0.0149	0.193
Flesh thickness (cm)	0.0015	-0.0009	-0.0029	0.0001	0.028	0.0001	0.003	-0.0005	-0.0007	**-0.0208**	-0.0004	-0.0043	0.002
Number of seeds per fruit	0.0003	-0.0005	-0.0022	-0.0006	0.1318	-0.0025	-0.0329	0.0017	-0.0003	0.0003	**0.0296**	-0.0184	0.106
Hundred seed weight (g)	0.0002	-0.0007	-0.0034	0.0007	-0.081	-0.003	0.0924	0.0015	-0.0008	-0.002	0.0124	**-0.0438**	-0.027

Bold values refer to direct effects
Residual effect: 0.2483