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# Correlation coefficient and Path analysis in Muskmelon *(Cucumis melo L.)*

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***ABSTRACT:*** *Correlation and path coefficient analysis in twenty two genotypes of muskmelon collected from the Patur and Balapur tehsils of Akola district were evaluated in summer season. As regards the genotypic and phenotypic correlation, the yield per vine was closely associated with weight of fruit and was positive and significant. While characters length of vine, internodal length, days for first female flower opening, number of fruits per vine, length of fruit, diameter of fruit, rind thickness and TSS, exhibited positive and non-significant correlation with yield per vine. Node at which first female flower appears, days for first fruit harvest, weight of seeds per fruit and number of seeds per fruit, showed negative and non-significant correlation with yield per vine. Path coefficient analysis indicated the importance of yield contributing characters viz., internodal length, number of fruits per vine, diameter of fruit and weight of fruit which showed high positive direct effects as the major yield contributing traits, for enhancing the yield of muskmelon. Based on direct and indirect effects of different yield components on yield it appears that it would be rewarding to give stress on the internodal length, number of fruits per vine, diameter of fruit and weight of fruit followed by length of vine, days for first female flower opening, length of fruit and rind thickness, while formulating selection indices for improvement of yield in muskmelon.*

***Keywords:*** *Correlation, Path analysis, Muskmelon, Path diagram*

## INTRODUCTION

Muskmelon (*Cucumis melo* L.) is one of the most important cucurbitaceous crop. It is grown as a dessert crop which quench thirst and add to the nutrient content of man's diet whereas non-dessert are used as vegetables. It is a annual crop with climbing, creeping or trailing vines of length upto 3 m. Leaves are deeply or shallowly lobed, flowers solitary, lemon yellow to deep orange colour and fruits many seeded pepo, fleshy. Muskmelon is native of tropical Africa. The fruit is valued for its attractive shape, size, wonderful colour and markings on the rind, taste flavour, colour of flesh and sweetness. The fruit is sweet with musky flavour and hence relished by all peoples. It is supposed to be very wholesome and nutritive.

The correlation measures the mutual relationship between different traits of a plant, it helps to access the best yield contributing traits. Path analysis deals with a close system of variables that are linearly related. It specifies the causes and generally measures their relative importance. Path analysis spilt the correlation coefficient into the measures of direct and indirect effect and determines direct and indirect contribution to the various characters towards the yield.

## MATERIAL AND METHODS

Twenty two gnenotype of muskmelon collected from Patur and Balapur tehsil of Akola district and obtained from University Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. It was grown in randomized block design with three replication at Main Garden, Department of Horticulture, Dr. PDKV, Akola during summer season. Each variety is sown in plot size 9 x 1.5 meter with a spacing 1.5 x 0.75 m. in furrow and basin system accommodated twenty four plants per treatment. The observations for twenty two traits were recorded on five randomly selected plants in each treatment and in each replication. The characters studied were length of vine, number of primary

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branches per vine, number of leaves per vine, leaf area, internodal length, node at which first female flower appears, days required for opening of first female flower, percentage of fruit set, days for first fruit harvest, number of fruits per vine, length of fruit, diameter of fruit, weight of fruit, rind thickness, flesh thickness, Total soluble solids, size of cavity, weight of seeds per fruit, number of seeds per fruit, 100 seed weight, seed per flesh proportion and yield per plant. The path coefficient analysis was calculated as suggested by Dewey and Lu (1959).

**RESULTS & DISCUSSION**

The degree of association between yield and yield contributing traits genotypic and phenotypic correlation coefficients were estimated are presented in Table 1. The estimates of genotypic correlations were slightly higher showing the little masking or modifying effects of the environment on the full expression of the characters under study.

The length of vine was positively and significantly correlated with internodal length and weight of fruit. It was positively correlated with node at which first female flower appears, days required for opening of first female flower, days for first fruit harvest, number of fruits per vine, length of fruit, diameter of fruit, rind thickness, TSS, number of seeds per fruit and yield per plant at both genotypic and phenotypic levels. Shanti Priya (2001) found close interrelationship between length of vine and mean weight of fruit.

The internodal length was positively and significantly correlated with weight of fruit at both genotypic and phenotypic levels. It was positively correlated with days required for opening of first female flower, days for first fruit harvest, number of fruits per vine, length of fruit, diameter of fruit, rind thickness, TSS and yield per plant.

The node at which first female flower appears exhibited positive correlation with days required for opening of first female flower, weight of fruit and number of seeds per fruit at both genotypic and phenotypic levels. Dhaliwal *et al.* (1996) in muskmelon reported node number of first female flower and days to picking were positively correlated with each other.

The days required for opening of first female flower was positively correlated with number of fruits per vine, length of fruit, diameter of fruit, rind thickness and yield per plant at both genotypic and phenotypic levels. Singh and Nandpuri (1978) in muskmelon observed positive correlation of maturity with days to opening of female flower, TSS, fruit weight and total yield per vine. Vijay (1987) in muskmelon found favourable correlation between days for flowering and fruit weight and flesh thickness.

The days for first fruit harvest exhibited positive but non-significant correlation with number of fruits per vine, length of fruit, diameter of fruit, weight of fruit, rind thickness, TSS and weight of seeds per fruit at both genotypic and phenotypic levels.

Vijay (1987) observed negative correlation between days to flowering and days to maturity at both genotypic and phenotypic levels. Somkuwar *et al.* (1997) reported favourable and significant association between days to first harvest and average fruit weight.

The length of fruit exhibited positive correlation with diameter of fruit, weight of fruit, rind thickness, TSS and yield per plant. Likewise, the number of fruits per vine was positively correlated with length of fruit, diameter of fruit, weight of fruit, rind thickness, TSS and yield per plant at both genotypic and phenotypic levels. Similar type of correlation was observed by Singh *et al.* (1976), Vijay (1987) and Dhaliwal *et al.* (1996), Somkuwar *et al.* (1997) reported highly significant and positive correlation between total yield per plant and number of fruits per plant.

The diameter of fruit exhibited significant and positive correlation with yield at phenotypic level and TSS at genotypic level. It also showed significant but negative correlation with TSS at phenotypic level. It also showed positive correlation with weight of fruit, rind thickness, number of seeds per plant and yield per plant. Singh and Ram (2003) showed that polar diameter and latitude diameter were positively correlated with fruit weight.

The fruit weight was positively correlated with rind thickness, and yield per plant at both genotypic and phenotypic levels. Positive correlation of average fruit weight with yield per plant, pulp thickness was also reported by Singh and Nandpuri (1978), Vijay (1987) and Dhaliwal *et al.* (1996). Somkuwar et al. (1997) observed positive and significant correlation of average weight of fruit with yield per vine.

The rind thickness exhibited positive correlation with TSS, number of seeds per fruit and yield per plant. TSS showed positive correlation with number of seeds per fruit and yield per plant at both genotypic and phenotypic levels. Vijay (1987) reported positive significant association of TSS with fruit weight, flesh thickness and days to maturity. Dhaliwal et al (1996) showed positive and significant correlation between TSS and downy mildew incidence. Likewise number

**Table 1**
**Estimates of Genotypic and Phenotypic Correlation**

| *Characters* | | *Length of vine (cm)* | *Internodal length (cm)* | *Node at which 1st first female flower Appears* | *Days required for opening of 1st female flower* | *Days for 1st fruit harvest* | *No. of fruits per vine* | *Length of fruit (cm)* | *Dia. of fruit (cm)* | *Wt. of fruit (g)* | *Rind thickness (cm)* | *Total soluble solids (%)* | *wt. of seed per fruit (g)* | *No of seeds per fruit* | *Yield per plant (kg)* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of vine (cm) | G | 1 | 0.428* | 0.001 | 0.129 | 0.146 | 0.242 | 0.108 | 0.373 | 0.619** | 0.094 | 0.327 | -0.321 | 0.069 | 0.240 |
| | P | 1 | 0.420 | 0.006 | 0.144 | 0.123 | 0.242 | 0.106 | 0.359 | 0.614** | 0.101 | 0.320 | -0.349 | 0.066 | 0.251 |
| Internodal length | G | | 1 | -0.405 | 0.385 | 0.192 | 0.157 | 0.098 | 0.277 | 0.453* | 0.131 | 0.395 | -0.239 | 0.141 | 0.349 |
| (cm) | P | | 1 | -0.032 | 0.407 | 0.175 | 0.147 | 0.091 | 0.260 | 0.449* | 0.137 | 0.034 | -0.266 | 0.133 | 0.363 |
| Node at which 1st | | | | | | | | | | | | | | | |
| female flower | G | | | 1 | 0.096 | -0.317 | -0.118 | -0.135 | -0.007 | 0.117 | -0.178 | -0.031 | -0.014 | 0.201 | -0.087 |
| appears | P | | | 1 | 0.091 | -0.326 | -0.108 | -0.128 | -0.000 | 0.126 | -0.178 | -0.034 | -0.008 | 0.212 | -0.092 |
| Days required for | | | | | | | | | | | | | | | |
| opening of | G | | | | 1 | -.039 | 0.274 | 0.194 | 0.174 | 0.170 | 0.242 | -0.007 | -0.154 | -0.076 | 0.336 |
| 1st flower | P | | | | 1 | -0.014 | 0.287 | 0.202 | 0.204 | 0.191 | 0.239 | -0.002 | -0.138 | -0.070 | 0.330 |
| Days for first | G | | | | | 1 | 0.0009 | 0.204 | 0.168 | 0.156 | 0.037 | 0.248 | 0.129 | 0.105 | -0.163 |
| fruit harvest | P | | | | | 1 | 0.006 | 0.214 | 0.123 | 0.128 | 0.056 | 0.221 | 0.088 | 0.114 | -0.152 |
| No. of fruits per vine | G | | | | | | 1 | 0.190 | 0.125 | 0.128 | 0.156 | 0.022 | -0.226 | -0.083 | 0.398 |
| | P | | | | | | 1 | 0.178 | 0.121 | 0.120 | 0.154 | 0.033 | -0.236 | -0.103 | 0.411 |
| Length of fruit (cm) | G | | | | | | | 1 | 0.106 | 0.164 | 0.188 | 0.229 | -0.066 | -0.244 | 0.211 |
| | P | | | | | | | 1 | 0.103 | 0.160 | 0.186 | 0.238 | -0.070 | -0.258 | 0.217 |
| Dia. Of fruit (cm) | G | | | | | | | | 1 | 0.319 | 0.297 | 0.441* | -0.214 | 0.063 | 0.411 |
| | P | | | | | | | | 1 | 0.298 | 0.316 | -0.431* | -0.216 | 0.059 | 0.439* |
| Wt. of fruits (g) | G | | | | | | | | | 1 | 0.047 | 0.347 | -0.157 | -0.059 | 0.297 |
| | P | | | | | | | | | 1 | 0.054 | 0.340 | -0.187 | -0.068 | 0.314 |
| Rind thickness (cm) | G | | | | | | | | | | 1 | 0.028 | -0.151 | 0.085 | 0.224 |
| | P | | | | | | | | | | 1 | 0.038 | -0.143 | 0.082 | 0.222 |
| Total soluble | G | | | | | | | | | | | 1 | -0.113 | 0.079 | 0.164 |
| solids (%) | P | | | | | | | | | | | 1 | -0.139 | 0.089 | 0.173 |
| Wt. of seeds | G | | | | | | | | | | | | 1 | 0.056 | -0.242 |
| per fruit (g) | P | | | | | | | | | | | | 1 | 0.055 | -0.234 |
| No. of seeds per fruit | G | | | | | | | | | | | | | 1 | -0.063 |
| | P | | | | | | | | | | | | | 1 | -0.059 |
| Yield per plant (kg) | G | | | | | | | | | | | | | | 1 |
| | P | | | | | | | | | | | | | | 1 |

** Significant at 1% level, * Significant at 5% level

**Table 2**
**Path Coefficient Analysis Showing Direct (Underlined) and Indirect effects of Various Traits on Yield**

| *Characters* | *Length of vine (cm)* | *Internodal length (cm)* | *Node at which 1st female flower Appears* | *Days required for opening of 1st female flower* | *Days for 1st fruit harvest* | *No. of fruits per vine* | *Length of fruit (cm)* | *Diameter of fruit (cm)* | *Wt. of fruit (g)* | *Rind thickness (cm)* | *Total soluble solids (%)* | *wt. of seed per fruit (g)* | *No of seeds per fruit* | *Yield per plant (kg)* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of vine (cm) | **-0.127** | 0.085 | -0.0003 | 0.011 | -0.050 | 0.062 | 0.015 | 0.135 | 0.122 | -0.002 | -0.021 | 0.005 | 0.003 | 0.237 |
| Internodal length **(cm)** | -0.054 | **0.199** | 0.007 | 0.035 | -0.066 | 0.040 | 0.014 | 0.100 | 0.089 | -0.002 | -0.025 | 0.003 | 0.007 | 0.338 |
| Node at which 1st female flower appears | -0.0002 | -0.008 | **-0.185** | 0.008 | 0.110 | -0.030 | -0.019 | -0.002 | 0.023 | 0.003 | 0.002 | 0.0002 | 0.010 | -0.088 |
| Days required for opening of first female flower | -0.016 | 0.076 | -0.017 | **0.091** | 0.013 | 0.070 | 0.028 | 0.063 | 0.033 | -0.005 | 0.0005 | 0.002 | -0.003 | 0.321 |
| Days for first fruit harvest | -0.018 | 0.038 | 0.058 | -0.003 | **-0.346** | 0.000 | 0.029 | 0.061 | 0.030 | -0.00008 | -0.016 | -0.002 | 0.005 | -0.160 |
| No. of fruits per vine | -0.030 | 0.031 | 0.021 | 0.025 | -00003 | **0.258** | 0.027 | 0.045 | 0.025 | -0.003 | -0.001 | 0.003 | -0.004 | 0.396 |
| Length of fruit **(cm)** | -0.013 | 0.019 | 0.025 | 0.017 | -0.071 | 0.049 | **0.143** | .038 | 0.032 | -0.004 | -0.014 | 0.001 | -0.012 | 0.210 |
| Diameter of fruit **(cm)** | -0.047 | 0.055 | 0.001 | 0.015 | -0.058 | 0.032 | 0.015 | **0.362** | 0.063 | -0.006 | -0.028 | 0.003 | 0.003 | 0410 |
| Wt. of fruit (g) | 0.079 | 0.090 | -0.021 | 0.015 | -0.054 | 0.033 | 0.023 | 0.115 | **0.198** | -0.001 | -0.022 | 0.002 | -0.003 | 0.456* |
| Rind thickness **(cm)** | -0.012 | 0.026 | 0.033 | 0.022 | -0.012 | 0.040 | 0.027 | 0.107 | 0.009 | **-0.021** | -0.001 | 0.002 | 0.004 | 0.224 |
| Total soluble solids (%) | -0.041 | 0.078 | 0.005 | -0.0007 | -0.086 | 0.005 | 0.033 | 0.160 | 0.068 | -0.0006 | **-0.064** | 0.001 | 0.004 | 0.161 |
| Wt. of seeds per fruit (g) | 0.041 | -0.047 | 0.002 | -0.014 | -0.044 | -0.058 | -0.009 | -0.077 | -0.031 | 0.003 | 0.007 | **-0.016** | 0.002 | -0.241 |
| No. of seeds per fruit | 0.008 | 0.028 | -0.037 | -0.007 | -0.036 | -0.021 | -0.035 | 0.022 | -0.011 | -0.001 | -0.005 | -0.0009 | **0.051** | -0.044 |

**Table 6**
**Total Direct and Indirect Effects of Different Characters on Yield**

| *Sr. No.* | *Characters* | *Correlation coefficient* | *Direct effect* | *Contribution (%)* | *Indirect effect* | *Contribution (%)* |
|---|---|---|---|---|---|---|
| 1 | Length of vine (cm) | 0.237 | -0.127 | -53.58 | 0.364 | 153.58 |
| 2 | Internodal length (cm) | 0.338 | 0.199 | 58.87 | 0.139 | 41.12 |
| 3 | Node at which 1st female flower appears | -0.088 | -0.185 | 210.22 | 0.097 | -110.22 |
| 4 | Days for 1st female flower opening | 0.321 | 0.091 | 28.34 | 0.230 | 71.65 |
| 5 | Days for first fruit harvest | -0.160 | -0.341 | 213.12 | 0.181 | -113.12 |
| 6 | Number of fruits per vine | 0.396 | 0.258 | 65.15 | 0.138 | 34.84 |
| 7 | Length of fruit (cm) | 0.210 | 0.143 | 68.09 | 0.067 | 31.90 |
| 8 | Diameter of fruit (cm) | 0.410 | 0.362 | 88.29 | 0.048 | 11.70 |
| 9 | Weight of fruit (g) | 0.454* | 0.198 | 43.61 | 0.256 | 56.38 |
| 10 | Rind thickness (cm) | 0.224 | -0.021 | -9.37 | 0.245 | 109.37 |
| 11 | Total soluble solids (%) | 0.161 | -0.064 | -39.75 | 0.225 | 139.75 |
| 12 | Wt. of seeds per fruit (g) | -0.241 | -0.016 | 6.66 | -0.225 | 93.36 |
| 13 | No. of seeds per fruit | -0.044 | 0.051 | -115.90 | -0.095 | 215.90 |

Residual effect : 0.530 * Significant at 5% level

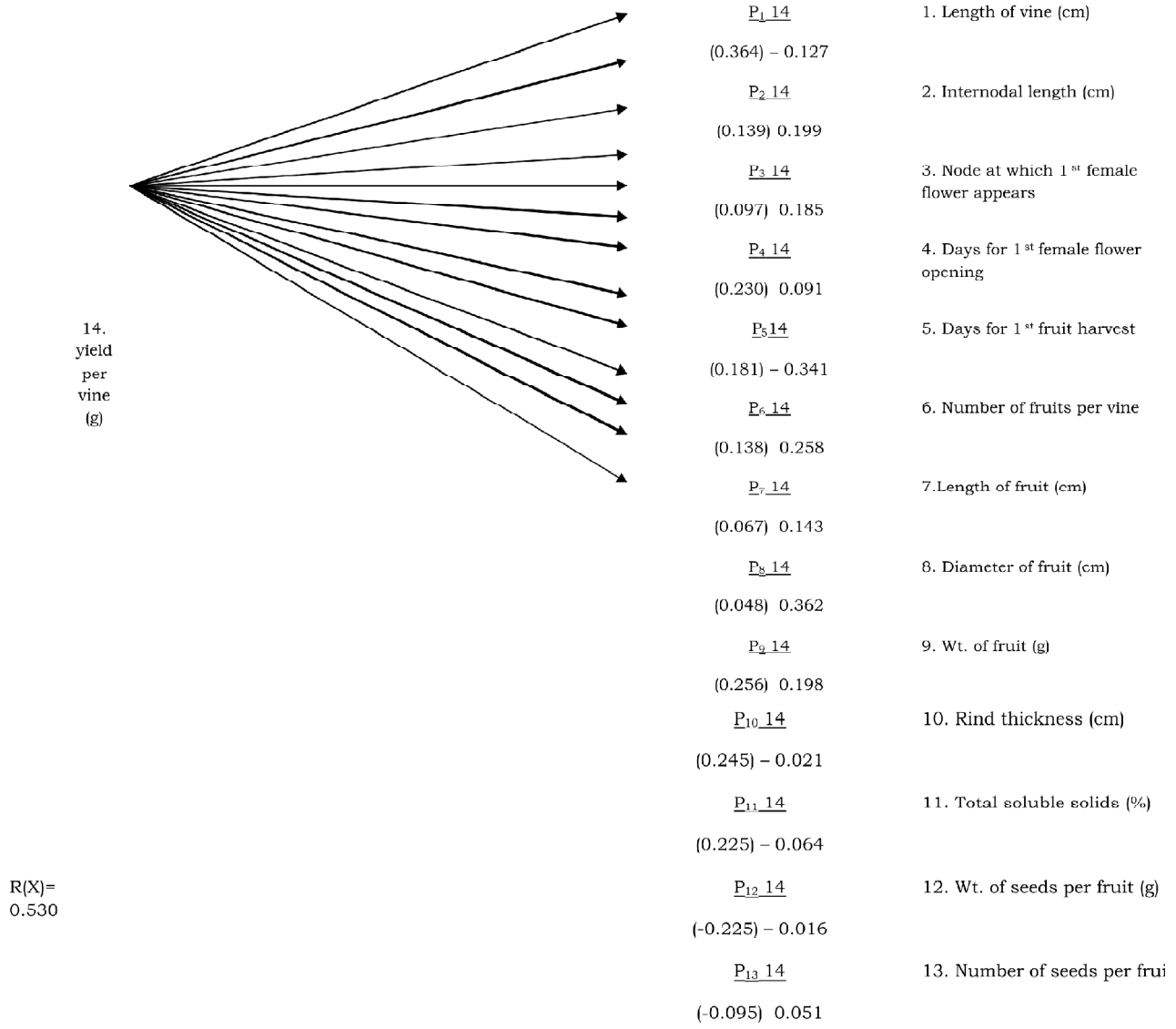


**Figure 1: Path Diagram and Coefficient of Factors Influencing Yield**

of seeds per fruit showed positive correlation with weight of seeds per fruit.

The correlation between internodal length, days required for opening of first female flower, number of fruits per vine, length of fruit, diameter of fruit, weight of fruit with yield was positive and non-significant whereas direct effect was positive and indirect effect was also positive. Thus path analysis had identified these characters as most important in breeding for high yield in muskmelon. The results are in agreement with those of Singh *et al.* (1976), Chhonkar (1979), Kalloo *et al.* (1983) and Vijay (1987) in muskmelon.

The characters, length of vine, rind thickness and TSS showed positive but non-significant correlation with yield and direct effect was negative whereas indirect effect of these characters was high and positive. Path analysis revealed that the correlation is mainly due to indirect effect of these characters through another component traits, these traits will be effective in yield improvement. Similar results were reported by Singh *et al.* (1976), Swamy (1984). Shanti Priya (2001) observed significant and positive correlation of mean weight of fruit, length of vine, number of primary branches per vine and 100 seed weight with yield per vine, in watermelon.

The negative and non-significant correlation was observed for the characters node at which at first female flower appears and days for first fruit harvest with yield per vine. Path analysis revealed that these characters had negative direct effect on yield and positive indirect effect on yield.

Vijay (1987) in variability, correlation and path analysis studies in muskmelon reported that number of fruits per vine and yield per vine had negative correlation with days to fruit maturity. The correlation between yield and weight of seeds per fruit was negative and non significant and the path analysis revealed that weight of seeds per fruit had negative direct and indirect effects. Path analysis showed in significant role of these characters in breeding for high yield in muskmelon. Likewise, the number of seeds per fruit showed negative and non-significant correlation with yield. Path analysis revealed that number of seeds per fruit had positive direct and negative indirect effect on yield. The path analysis thus pin pointed the in significant role of this character in muskmelon breeding.

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