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# Studies on correlation and path analysis in finger millet (*Eleusine coracana* L. Gaertn)

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**Abstract**
A study entitled "Studies on correlation and path analysis in finger millet (*Eleusine coracana* L. Gaertn)" was performed at the Instructional cum Research Farm of Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.), during *Kharif* 2021 in randomized complete block design (RCBD) with two replications to assess thirty genotypes of finger millet. A study of correlation and path coefficient analysis for yield and yield attributes were carried out with thirty-five finger millets genotypes. The correlation analysis indicated that grain yield per plant exhibited significant positive association with days to 50% flowering, days to maturity, number of fingers, finger width, biological yield and harvest index both at genotypic and phenotypic levels. Path analysis revealed that highest positive direct effect was exhibited by biological yield, harvest index, days to 50% flowering, finger width, number of fingers and number of tillers per plant. Thus, these traits may be used as selection criteria for screening of promising finger millet genotypes.

**Keywords:** Correlation and path coefficient analysis, finger millet, grain yield

## Introduction

Finger millet (*Eleusine coracana* L. Gaertn), also known as Bird foot millet, ragi, or African millet (*Eleusine coracana* L. Gaertn). This crop is indigenous to Africa (Abyssinian, currently known as Ethiopia's origin). It is a self-pollinated (allopolyploid) crop with 2n=4x=36 chromosomes that arose from a hybrid between two diploid species, *Eleusine indica* (AA) and *Eleusine floccifolia* (BB), as genome donors (Chennaveeraiah and Hiremath, 1974, Hilu and de Wet, 1976) [4, 9]. It belongs to the family Poaceae and is commonly farmed in the world's arid and semi-arid regions. Eleusine is derived from Eleusis, an ancient epic city consecrated to Demeter, the Greek goddess of agriculture. Coracana is derived from kurukkan, the grain's singhali name. Ragi is an abbreviation for the Sanskrit word "Rajika," which means "red"(Negi *et al.*, 2016) [12]. Millets are small-seeded grass that includes around ten genera and twenty species. Sorghum and pearl millet are examples of major millets, whereas other millets are examples of minor millets. The majority of small millets are Asian and African in origin. East Asia, the Indian Subcontinent, and the Ethiopian highlands of Africa are the most crucial domesticated regions. Minor millets have a long history of cultivation in India, with a diverse range of millets produced throughout the country. As a result, India is considered a minor millet centre. These are grown from the south to 3000m from sea level in the north, mostly in the Himalayas and the North Eastern Hills (Bisht and Singh, 2009) [12].

It covered 1048.81 million hectares in India, producing 1637.20 lakh tonnes and yielding 1561 thousand kg/ha. It has a land area of 6.29 lakh hectares in Chhattisgarh and produces and yields 1.42 lakh tonnes and 226 thousand kg/ha, respectively (Anonymous, 2021). This crop is grown in India under a variety of climatic and growing circumstances, from southern Karnataka state to the Himalayan foothills. Ragi is widely referred to as a "nutritious millet" since it is nutritionally superior than many cereal bowls, providing individuals with enough amounts of proteins, minerals, calcium, and vitamins. It includes all of the nutrients, including protein (9.2%), carbohydrate (76.32%), and fat (1.29%). It has a high mineral content (2.70%), including calcium (452mg/100g) and iron (3.90%), both of which are vital components of a healthy human diet (Pandey and Kumar, 2005) [15]. Correlation studies provide knowledge of association among different characters and grain yield. The study of association among various traits is useful for breeders in selecting genotypes possessing groups of desired traits. The path coefficient analysis provides a more realistic picture of the relationship as it considers direct as well as indirect effects of the variables by partitioning the Correlation.

The path coefficient analysis provides a more realistic picture of the relationship as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficients. All plant breeding projects have one purpose in mind: to maximize economic output. Keeping in mind the expanding population and global climate change, we need to breed varieties with improved yield and quality characteristics to suit the needs of the future population.

## Materials and Methods

The current study, titled "Studies on correlation and path analysis in finger millet (*Eleusine coracana* L. Gaertn)" was carried out in *Kharif* 2021 at the Research cum Instructional Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.), which is located at 19°4'0" N and 82°2'0" E, at an altitude of 552 meters above mean sea level.

The observations were recorded on five randomly selected plants from each treatment in each replication for all the characters except days to 50% flowering and days to maturity and the average of these five plants was worked out for the statistical computation and further used for the genetic diversity study. Correlation coefficients were estimated by formula suggested By Miller *et al*., (1958) [11] and path coefficient analysis by Formula suggested by Dewey and Lu (1959) [6].

## Results and Discussion

In the present investigation, grain yield per plant was found to be highly significant and positively correlated with days to 50% flowering, days to maturity, number of fingers per ear, finger width (cm), biological yield (g), harvest index (%), and finger width, indicating that these attributes were mainly influencing the grain yield in finger millet. Thus, selection practiced in a character will automatically result in the improvement of other character even though direct selection for improvement has not been made for the yield character. Similar results exhibiting highly significant and positive correlation between grain yield and other traits as obtained in the present investigation were also reported by Patel *et al.*, (2020) [16] and Shet *et al.*, (2010) [17] for finger width and harvest index, Chavan *et al*., (2020) [5] for days to 50% flowering and number of fingers per ear Gautham *et al*., (2020) [8] The correlation between all possible combinations among the characters was estimated at genotypic and phenotypic level is presented in Table 1 and 2.

Path coefficient analysis is a tool to partition the observed correlation coefficient in direct and indirect effects of yield components on grain yield to provide clear picture of character associations for formulating efficient selection strategy. Path analysis differs from simple correlations in that it points out the cause and their relative importance, whereas the latter measure simply the mutual association ignoring the causation. Path analysis is one which provides information on the cause of such association (Wright, 1921 and Dewey and Lu, 1959) [18, 6]. The results of various causes influencing grain yield are shown in Table 3. In present study, the path coefficient analysis was carried out at phenotypic level. Biological yield per plant (0.8795) followed by harvest index (0.2999), days to 50% flowering (0.0321) and finger width (0.0173) exhibited considerable positive direct effect on grain yield per plant at phenotypic level (Table 3). Thus, biological yield per plant and harvest index emerged as most important direct yield contributing characters. Hence, direct selection for these traits would be rewarding for yield improvement, which will also reduce the undesirable effects of the studied component traits. These characters have also been identified as major direct contributors towards grain yield in finger millet by former workers Nirmalakumari *et al*., (2010) [14] Kumar *et al*., (2014) [10], Negi *et al*., (2017) [13], Patel *et al*., (2020) [16], Yadav and Kumar, (2021) [19].

**Table 1:** Genotypic correlations coefficient between different traits in finger millet genotypes

| Characters | DFF | DM | PH (cm) | TP | NF | FW (cm) | FL (cm) | NGE | TW (g) | BY (g) | HI (%) | GY (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DF | | 0.904** | 0.206 | 0.310* | 0.416** | 0.588** | 0.011 | 0.479** | 0.202 | 0.482** | 0.240 | 0.495** |
| DM | | | 0.361** | 0.212 | 0.550** | 0.647** | -0.251 | 0.526** | 0.161 | 0.529** | 0.263* | 0.538** |
| PH (cm) | | | | 0.465** | -0.085 | 0.395** | 0.102 | 0.096 | 0.548** | 0.110 | 0.087 | 0.121 |
| TP | | | | | 0.030 | 0.477** | 0.146 | 0.115 | -0.416** | 0.043 | 0.100 | 0.064 |
| NF | | | | | | 0.461** | -0.145 | 0.383** | 0.076 | 0.527** | 0.016 | 0.485** |
| FW (cm) | | | | | | | -0.166 | 0.564** | 0.576** | 0.807** | 0.227 | 0.780** |
| FL (cm) | | | | | | | | 0.276* | 0.370** | -0.300* | 0.202 | -0.242 |
| NGE | | | | | | | | | 0.550** | 0.091 | 0.262* | 0.139 |
| TW(g) | | | | | | | | | | 0.039 | -0.208 | 0.000 |
| BY(g) | | | | | | | | | | | 0.392** | 0.982** |
| HI (%) | | | | | | | | | | | | 0.555** |

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

DF= Days to 50% flowering, DM=Days to maturity, PH=Plant height, TP=Tillers per plant, NF=Number of fingers, FW=Finger width, FL=Finger length, NGE=Number of grains per ear, TW=Test weight, BY=Biological yield, HI=Harvest index, GY= Grain yield

**Table 2:** Phenotypic correlations coefficients between different traits in finger millet genotypes

| Characters | DF | DM | PH (cm) | TP | NF | FW (cm) | FL (cm) | NGE | TW (g) | BY (g) | HI (%) | GY (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DF | | 0.834** | 0.176 | 0.186 | 0.270* | 0.408** | -0.005 | 0.462** | 0.113 | 0.467** | 0.150 | 0.478** |
| DM | | | 0.180 | 0.194 | 0.369** | 0.404** | -0.143 | 0.485** | 0.076 | 0.498** | 0.159 | 0.505** |
| PH (cm) | | | | 0.095 | -0.195 | 0.219 | 0.021 | 0.114 | 0.302* | 0.040 | 0.056 | 0.047 |
| TP | | | | | 0.001 | 0.262* | 0.042 | 0.082 | -0.079 | 0.084 | 0.011 | 0.087 |
| NF | | | | | | 0.094 | -0.092 | 0.262* | 0.036 | 0.336** | 0.157 | 0.359** |
| FW (cm) | | | | | | | -0.157 | 0.360** | 0.297* | 0.542** | 0.081 | 0.522** |
| FL (cm) | | | | | | | | 0.225 | 0.117 | -0.259* | 0.006 | -0.239 |
| NGE | | | | | | | | | 0.391** | 0.093 | 0.166 | 0.135 |
| TW(g) | | | | | | | | | | 0.039 | -0.113 | -0.001 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BY(g) | | | | | | | | | | | 0.176 | 0.954** |
| HI (%) | | | | | | | | | | | | 0.458** |

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

DF= Days to 50% flowering, DM=Days to maturity, PH=Plant height, TP=Tillers per plant, NF=Number of fingers, FW=Finger width, FL=Finger length, NGE=Number of grains per ear, TW=Test weight, BY=Biological yield, HI=Harvest index, GY= Grain yield

**Table 3:** Phenotypic path coefficients for yield and yield components in Finger millet (*Eleusine coracana* L. Gaertn)

| Characters | DF | DM | PH | TP | NF | FW | FL | NGE | TW | BY | HI | GY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DF | 0.0231 | -0.0057 | -0.0013 | 0.0008 | 0.0034 | 0.0071 | 0.0000 | -0.0049 | -0.0002 | 0.4107 | 0.0451 | 0.478** |
| DM | 0.0192 | -0.0068 | -0.0014 | 0.0008 | 0.0046 | 0.0070 | 0.0011 | -0.0052 | -0.0001 | 0.4381 | 0.0476 | 0.505** |
| PT | 0.0041 | -0.0012 | -0.0076 | 0.0004 | -0.0024 | 0.0038 | -0.0002 | -0.0012 | -0.0005 | 0.0351 | 0.0167 | 0.047 |
| TP | 0.0043 | -0.0013 | -0.0007 | 0.0043 | 0.0000 | 0.0045 | -0.0003 | -0.0009 | 0.0001 | 0.0740 | 0.0034 | 0.087 |
| NF | 0.0062 | -0.0025 | 0.0015 | 0.0000 | 0.0125 | 0.0016 | 0.0007 | -0.0028 | -0.0001 | 0.2954 | 0.0470 | 0.359** |
| FW | 0.0094 | -0.0027 | -0.0017 | 0.0011 | 0.0012 | 0.0173 | 0.0012 | -0.0038 | -0.0005 | 0.4766 | 0.0243 | 0.522** |
| FL | -0.0001 | 0.0010 | -0.0002 | 0.0002 | -0.0011 | -0.0027 | -0.0074 | -0.0024 | -0.0002 | -0.2280 | 0.0018 | -0.239 |
| NGE | 0.0106 | -0.0033 | -0.0009 | 0.0004 | 0.0033 | 0.0062 | -0.0017 | -0.0106 | -0.0006 | 0.0816 | 0.0497 | 0.135 |
| TW | 0.0026 | -0.0005 | -0.0023 | -0.0003 | 0.0004 | 0.0051 | -0.0009 | -0.0042 | -0.0016 | 0.0344 | -0.0339 | -0.001 |
| BY | 0.0108 | -0.0034 | -0.0003 | 0.0004 | 0.0042 | 0.0094 | 0.0019 | -0.0010 | -0.0001 | 0.8795 | 0.0527 | 0.954** |
| HI | 0.0035 | -0.0011 | -0.0004 | 0.0001 | 0.0020 | 0.0014 | 0.0000 | -0.0018 | 0.0002 | 0.1545 | 0.2999 | 0.458** |

Residual effect = 0.00202 *, ** significant at 5% and 1% level, respectively

DF= Days to 50% flowering, DM=Days to maturity, PH=Plant height, TP=Tillers per plant, NF=Number of fingers, FW=Finger width, FL=Finger length, NGE=Number of grains per ear, TW=Test weight, BY=Biological yield, HI=Harvest index, GY= Grain yield

## Conclusion

In general, correlation and path analysis concluded that the days to 50% flowering, days to maturity, number of fingers per ear, finger width (cm), biological yield (g), harvest index (%) influenced the grain yield more than any of the other characters. Hence, it would be worthwhile to lay more emphasis on these characters in selection programme to improve the grain yield in finger millet.

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