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# CORRELATION AND PATH COEFFICIENT ANALYSIS IN MAIZE (*ZEA MAYS* L.) FOR GREEN FODDER, GRAIN YIELD AND ITS QUALITY ATTRIBUTES

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**ABSTRACT**

Maize (*Zea mays* L.) is an important cereal crop widely cultivated for food, feed, and fodder due to its high yield potential and adaptability. The present investigation aimed to assess the association among grain yield, green fodder yield, and their contributing traits through correlation and path coefficient analysis in maize genotypes. The experiment was conducted during Kharif 2024, Ranchi Veterinary College, BAU, Ranchi, India. A total of 34 maize genotypes, including two check varieties, were evaluated under a Randomized Block Design with two replications in separate dual-purpose and fodder trials. Significant variability was observed among genotypes for most of the studied traits in both trials, indicating ample scope for selection. Correlation analysis revealed that plant height, ear traits, kernel weight, and shelling percentage were positively associated with grain yield in the dual-purpose trial, while green fodder yield showed strong positive relationships with plant height, green fodder yield per day, and dry matter yield in the fodder trial. Genotypic correlations were generally higher than phenotypic correlations, suggesting a stronger genetic influence on trait expression. Path coefficient analysis indicated that green fodder yield per day, days to 50% flowering, and plant height exerted major direct effects on fodder yield, whereas ear traits and shelling percentage contributed significantly to grain yield. Among the evaluated genotypes, IC0335184 showed promising performance for both grain and fodder traits, indicating its potential utility in dual-purpose maize improvement programs.

***Keywords*:** Maize (*Zea mays* L.), grain yield, green fodder yield, Genotypic correlations, phenotypic correlations

## Introduction

Maize (*Zea mays* L.) (2n = 20) is the third most important cereal crop in India after rice and wheat in terms of cultivated area and production. It belongs to the tribe Maydeae of the family Gramineae. Maize is a versatile crop grown under a wide range of agro-climatic conditions. In India, it can be cultivated during summer, monsoon and winter seasons, with the monsoon season being the most important. The crop grows best at moderate temperatures ranging from 24–30°C and requires sufficient moisture for proper growth. The minimum temperature required for seed germination is about 10°C. Maize is cultivated globally between 58°N and 40°S latitudes, at elevations from below sea level to over 3000 m, and under annual rainfall ranging from 250 mm to more than 5000 mm (Shaw, 1988).

Botanically, maize is a tall annual grass and a monoecious plant bearing separate male and female inflorescences on the same plant. The male inflorescence forms the tassel at the top of the plant, while the female inflorescence develops into ears on the middle portion of the stem. The crop is predominantly cross-pollinated and pollination occurs mainly through wind. Maize possesses three types of roots seminal, adventitious and brace roots and follows the C4 photosynthetic pathway, enabling efficient growth in warm climates.

Globally, maize is one of the most widely produced cereal crops with a production of about 1,228.1 million tonnes from 197.2 million hectares (FAOSTAT, 2023). Approximately 61% of the total production is used as livestock feed, 17% for food and about 22% for industrial purposes (ICAR-IIMR). India ranks sixth among maize-producing countries with an annual production of about 31.65 million tonnes. According to the First Advance Estimates for 2023–24, maize production in India is estimated at around 224.82 lakh metric tonnes (Department of Agriculture and Farmers Welfare, 2023).

Maize is widely utilized as food, feed and fodder and is often referred to as the "Queen of cereals" due to its high genetic yield potential. As a fodder crop, it is valued for its rapid growth, high biomass production, palatability and nutritional quality. India currently faces a significant deficit in fodder availability, particularly green fodder, which necessitates the development of high-yielding maize genotypes.

Understanding the association among yield and its contributing traits is essential for effective crop improvement. Correlation analysis helps determine the relationship between characters, while path coefficient analysis partitions these relationships into direct and indirect effects (Dewey and Lu, 1959). Therefore, the present study was undertaken to evaluate variability among maize genotypes and to assess the relationship between green fodder yield, grain yield and their associated traits.

## Materials and Methods

The present investigation entitled "Correlation and Path Analysis in Maize (*Zea mays* L.) for Green Fodder, Grain Yield and Quality Attributes" was conducted during Kharif 2024 at Ranchi Veterinary College (RVC), BAU, Kanke, Ranchi, Jharkhand, India. The experimental site is located at 23°17′ N latitude and 85°19′ E longitude with an altitude of 625 m above mean sea level. The soil of the experimental field was sandy loam and the region falls under Agro-climatic Zone IV. Meteorological data including rainfall, temperature, relative humidity and sunshine hours during the crop growth period were obtained from the university meteorological observatory.

The experimental material comprised 34 maize genotypes, including two check varieties. Among the test entries, 28 genotypes were obtained from the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, while four genotypes were collected from BAU, Ranchi. The experiment was laid out in a Randomized Block Design (RBD) with two replications. Two separate trials were conducted in adjacent plots to evaluate the genotypes for dual purpose (grain and fodder) and fodder purpose. In the dual-purpose trial, the crop was planted at a spacing of 60 × 20 cm, with each plot consisting of two rows of 3 m length and a plot size of 3.6 m². In the fodder trial, the spacing was maintained at 30 × 20 cm, with two rows of 3 m length per plot and a plot size of 1.8 m². A recommended fertilizer dose of 80:40:20 kg N:P:K ha$^{-1}$ was applied uniformly to all plots and standard agronomic practices were followed throughout the crop growth period to raise a healthy crop.

Observations were recorded from five randomly selected competitive plants in each replication. For dual-purpose maize, data were recorded on days to 50% flowering, days to 50% silking, days to 75% dry husk, anthesis–silking interval (ASI), plant height, ear height, number of ears per plant, number of kernels per ear, ear length, ear diameter, 1000-kernel weight, shelling percentage, grain yield, moisture content and grain protein percentage. For fodder maize, observations included days to 50% flowering, plant height, green fodder yield (q ha$^{-1}$), green fodder yield per day, dry matter yield (q ha$^{-1}$), dry matter yield per day, dry matter percentage, leaf–stem ratio and crude protein content. Protein content in both grain and fodder samples was estimated using the Micro-Kjeldahl method, and crude protein percentage was calculated by multiplying the nitrogen content by a factor of 6.25.

The incidence of banded leaf and sheath blight (BLSB) was assessed using a 1–5 disease rating scale, where 1 represented resistant reaction and 5 indicated highly susceptible reaction. The recorded data were subjected to statistical analysis using analysis of variance (ANOVA) for Randomized Block Design following the method described by Singh and Chaudhary (1979). Range, standard error, coefficient of variation (CV) and critical difference (CD) were also computed. Genetic parameters such as genotypic and phenotypic variance, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability in broad sense and genetic advance were estimated using standard procedures. Genotypic and phenotypic correlation coefficients were calculated to determine the association among different traits, and path coefficient analysis was performed according to Dewey and Lu (1959) to partition the correlation coefficients into direct and indirect effects of different characters on yield.

## Result and Discussion

### Dual Purpose Trial

Analysis of variance (ANOVA) was performed for seventeen characters including days to 50% flowering, 50% silking, ASI, days to 75% dry husk, plant height, ear height, number of ears per plant, kernels per ear, ear length, ear diameter, 1000-kernel weight, shelling percentage, grain yield, moisture content and protein content among 34 maize genotypes (Table 1). The results showed highly significant differences (1% level) for most of the traits, while days to 75% dry husk, grain yield (g plot$^{-1}$), grain yield (q ha$^{-1}$) and shelling percentage were significant at the 5% level, indicating the presence of genetic variability among the genotypes.

The mean performance of 34 maize genotypes for 17 characters in the dual-purpose trial is presented in Table 3, indicating substantial variation among the genotypes.

Days to 50% flowering ranged from 44.0 days (IC0335131) to 51.5 days (BAUFM-122, BAUFM-123 and IC0335192) with a mean of 47.28 days. Days to 50% silking varied from 48.0 days (IC0335131) to 55.5 days (IC0335192) with an average of 50.94 days. Anthesis–silking interval (ASI) ranged from 3.0 days (IC0335202 and IC0335177) to 4.05 days, with a mean of 3.66 days. Days to 75% dry husk varied from 91.3 days (IC0335131) to 100 days (BAUFM-123) with an average of 94.12 days. Plant height ranged from 126.3 cm (IC0335178) to 215.0 cm (African Tall) with a mean of 160.19 cm, whereas ear height varied from 21.75 cm (IC0335184) to 54.75 cm (IC0335202) with an average of 31.29 cm. Number of ears per plant ranged from 1.0 to 1.7, with IC0335184 recording the highest value. Kernels per ear varied from 200 (IC0335188) to 312.5 (IC0335184) with a mean of 250.19.Ear length ranged from 10.8 cm (IC0335175) to 15.55 cm (BAUFM-123) with a mean of 13.37 cm, while ear diameter varied from 2.25 cm (IC0335188) to 3.35 cm (African Tall) with an average of 2.73 cm. Kernel weight ranged from 165 g (IC0335175) to 220 g (IC0335184) with a mean of 186.52 g. Shelling percentage ranged from 68.8% to 85.3% with an average of 75.8%.Grain yield at 15% moisture ranged from 26.04 g (IC0335160) to 43.38 g (IC0335184) with a mean of 33.44 g. Grain yield per plot varied from 685.3 g to 945.85 g, while grain yield ranged from 19.04 q ha$^{-1}$ to 26.28 q ha$^{-1}$ with an average of 21.80 q ha$^{-1}$. Moisture content varied between 10.10% and 14.05% with a mean of 11.80%, whereas protein content ranged from 7.70% to 10.25% with an average of 8.78%.

### Fodder Purpose Trial

The ANOVA results for the fodder trial (Table 2) revealed highly significant differences among the 34 genotypes for days to 50% flowering, plant height, green fodder yield (q ha$^{-1}$ day$^{-1}$), dry matter yield (q ha$^{-1}$), dry matter yield (q ha$^{-1}$ day$^{-1}$), dry matter percentage, leaf–stem ratio and crude protein content. Green fodder yield (q ha$^{-1}$) showed significant variation among the genotypes.

The mean performance of the 34 maize genotypes for fodder traits is presented in Table 4 and showed considerable variability.

Days to 50% flowering ranged from 42.5 days (IC0335162) to 51.5 days (BAUFM-123) with a mean of 46.47 days. Plant height varied from 137.40 cm (IC0335184) to 192.90 cm (IC0335199) with an average of 166.19 cm. Green fodder yield ranged from 357.5 q ha$^{-1}$ (IC0335178 and SUWAN) to 455.0 q ha$^{-1}$ (IC0335190) with a mean of 387.87 q ha$^{-1}$ hile green fodder yield per day varied from 7.32 to 10.47 q ha$^{-1}$ day$^{-1}$ with an average of 8.37 q ha$^{-1}$ day$^{-1}$. Dry matter yield ranged from 66.56 q ha$^{-1}$ (IC0335202) to 108.66 q ha$^{-1}$ (IC0335160) with a mean of 87.68 q ha$^{-1}$, whereas dry matter yield per day varied from 1.34 to 2.31 q ha$^{-1}$ day$^{-1}$ with an average of 1.89 q ha$^{-1}$ day$^{-1}$. Dry matter percentage ranged from 17.88% to 25.87% with a mean of 22.64%.Leaf–stem ratio ranged from 0.55 to 0.82 with an average of 0.64, while crude protein content varied from 8.06% to 12.55% with a mean of 10.54%. These results indicate considerable variation among genotypes for fodder yield and quality traits.

### Correlation and path coefficient analysis

### Dual purpose maize

The genotypic and phenotypic correlation coefficients among yield and yield-contributing traits in maize are presented in Table 5. Correlation analysis is essential for understanding the magnitude and direction of associations among traits and provides guidance for indirect selection in breeding programs. Overall, genotypic correlations were generally higher than their phenotypic counterparts, indicating that genetic factors strongly influence trait relationships, whereas environmental conditions partially modify phenotypic expression. In certain cases, phenotypic correlations exceeded genotypic values, suggesting environmental enhancement of trait associations.

### Genotypic Correlations

Days to 50% flowering showed a highly significant positive genotypic correlation with days to 50% silking, days to 75% dry husk, plant height, ear height, number of ears per plant, ear length, kernel weight, and grain yield, while exhibiting a negative association with anthesis-silking interval (ASI). Similarly, days to 50% silking was positively correlated with plant height, ear height, number of ears per plant, ear length, and grain yield, indicating that delayed silking is linked with increased yield components. ASI displayed negative correlations with several yield traits, highlighting its detrimental effect. Traits such as days to 75% dry husk, plant height, ear height, number of ears per plant, kernels per ear, ear length, ear diameter, kernel weight, shelling percentage, and moisture content all showed varying degrees of positive genotypic association with grain yield, emphasizing their roles in yield determination. Protein content exhibited low to moderate positive associations with certain yield traits but a negative correlation with number of ears per plant.

### Phenotypic Correlations

Phenotypic correlations mirrored the genotypic trends but were generally lower in magnitude, reflecting environmental influence. Days to flowering and silking, plant height, ear height, number of ears per plant, kernel number and weight, ear length and diameter, shelling percentage, and grain yield were positively associated, while ASI had mostly weak negative correlations with yield traits.

Correlation analysis revealed that genotypic correlations among maize yield and yield-contributing traits were generally higher than phenotypic correlations, indicating strong genetic control with environmental modulation of trait expression (Falconer and Mackay, 1996; Hallauer *et al*., 2010). Days to 50% flowering showed positive genotypic associations with plant height, ear traits, and grain yield, but negative correlations with anthesis–silking interval (ASI), suggesting that earlier flowering and reduced ASI favour yield (Bolaños and Edmeades, 1996). Traits such as plant height, ear number, kernel number, and kernel weight were positively correlated with yield, highlighting their utility for indirect selection. Phenotypic correlations were lower in magnitude but mirrored genotypic trends, reflecting environmental influence. Weak negative correlations of ASI with yield traits emphasize its role as a stress indicator affecting fertilization and grain set. Overall, selection for key developmental and yield traits can effectively improve grain yield in dual-purpose maize, with genotypic relationships providing more reliable guidance than phenotypic observations (Lafitte and Edmeades, 1995; Messmer *et al*., 2009).

### Path Coefficient Analysis

Path coefficient analysis was conducted to partition correlations into direct and indirect effects on grain yield. Genotypic path coefficients were generally higher than phenotypic ones, confirming that genetic factors exert stronger influence than environmental conditions.

At the genotypic level, days to 50% flowering, plant height, ear height, number of ears per plant, shelling percentage, and moisture content showed substantial positive direct effects on grain yield. Other traits, including kernel weight, ear length, and protein content, exhibited negative or low direct effects but contributed indirectly through positive associations with other yield attributes. Phenotypic path analysis revealed similar trends, with traits such as ear length, kernel weight, shelling percentage, and moisture content showing positive direct contributions to grain yield, while protein content maintained a minor positive effect.

Path coefficient analysis indicated that genotypic effects on grain yield were generally stronger than phenotypic effects, highlighting the predominant role of genetic factors in yield determination (Dewey and Lu, 1959; Hallauer *et al*., 2010). Traits such as days to 50% flowering, plant height, ear height, number of ears, shelling percentage, and moisture content exerted substantial positive direct effects, suggesting their critical contribution to yield improvement. Other traits, including kernel weight, ear length, and protein content, influenced yield indirectly through their associations with key yield components. Phenotypic analysis mirrored these trends, though environmental effects slightly modified the magnitudes. These results underscore the utility of path analysis in identifying traits with both direct and indirect influence on grain yield, guiding effective selection in maize breeding programs (Singh and Chaudhary, 1979; Gauch, 1982).

### Fodder purpose maize

### Genotypic and Phenotypic Correlation Analysis

Correlation analysis was conducted to determine the nature and strength of associations among green fodder yield (GFY) and its component traits at both genotypic and phenotypic levels (Table 6). Understanding these relationships aids in identifying traits for indirect selection in fodder maize breeding programs. Generally, genotypic correlations were stronger than phenotypic correlations, reflecting the influence of inherent genetic factors, whereas environmental conditions modulated phenotypic expression.

GFY(q/ha) exhibited positive genotypic associations with plant height (0.459), GFY per day (0.684), dry matter yield (0.314), and crude protein content (0.072), while negative but non-significant correlations were observed with dry matter percentage (0.229) and leaf-stem ratio (0.119). Phenotypically, GFY correlated significantly with GFY per day (0.790), dry matter yield (0.560), and dry matter per day (0.431), but showed weak or negative associations with plant height (0.162), crude protein (0.042), dry matter percentage (0.209), and leaf-stem ratio (0.054). These results indicate stronger genetic associations of yield with its components compared to phenotypic expressions.

Genotypically, days to 50% flowering correlated positively with plant height (0.546) and protein content (0.092) but negatively with GFY per day (–0.608) and dry matter per day (–0.439). Phenotypic correlations mirrored this trend, with early-flowering genotypes tending to achieve higher daily fodder and dry matter accumulation.

Plant height showed positive genotypic correlations with GFY (0.459) and protein content (0.349) but weak negative associations with dry matter traits and leaf-stem ratio. Phenotypically, plant height correlated positively with protein content (0.320) but negatively with daily fodder and dry matter yield, suggesting taller plants contribute more to protein but not necessarily to daily biomass accumulation.

Traits such as GFY per day, dry matter yield, dry matter per day, and dry matter percentage showed strong positive genotypic and phenotypic correlations among themselves, while leaf-stem ratio and crude protein exhibited predominantly negative or weak associations, indicating that higher stem proportion favours biomass accumulation but reduces protein content, whereas protein is largely independent of most yield traits.

Correlation analysis indicated that genetic factors predominantly govern green fodder yield (GFY) and its components, as genotypic correlations were generally stronger than phenotypic ones. GFY showed strong positive associations with plant height, GFY per day, dry matter yield, and crude protein content, highlighting these traits as key contributors to fodder productivity. Early-flowering genotypes were associated with higher daily fodder and dry matter accumulation, while taller plants contributed more to protein content rather than daily biomass. Traits such as dry matter yield, dry matter per day, and GFY per day exhibited mutually strong positive associations, whereas leaf-stem ratio and crude protein showed negative or weak correlations, indicating that increased stem proportion enhances biomass but lowers protein content. These insights emphasize that indirect selection for traits like plant height, GFY per day, and dry matter yield could improve overall fodder yield and quality (Dewey and Lu, 1959; Hallauer *et al.*, 2010; Singh and Chaudhary, 1979).

**Path Coefficient Analysis**

Path analysis partitioned correlations into direct and indirect effects on GFY. At the genotypic level, GFY per day had the highest positive direct effect (1.123), highlighting it as the most influential trait. Days to 50% flowering exhibited a strong positive direct effect (1.027) but large negative indirect effects via GFY per day and dry matter per day reduced its overall contribution. Plant height showed a minor positive direct effect, supported by indirect pathways. In contrast, dry matter yield and dry matter percentage displayed negative direct effects, although positive indirect contributions partially offset this impact. Leaf-stem ratio and crude protein percentage had weak and inconsistent effects, with crude protein showing slightly negative direct and indirect contributions, confirming its limited influence on fodder yield. Overall, traits such as GFY per day, days to flowering, and plant height are key determinants of fodder yield, while crude protein and leaf-stem ratio play relatively minor roles, emphasizing the importance of selecting for high daily biomass accumulation in breeding programs.

Path coefficient analysis revealed that GFY per day is the most influential trait for green fodder yield, exhibiting the highest positive direct effect. Days to 50% flowering and plant height also contributed positively, although the overall effect of flowering was reduced by negative indirect influences through GFY per day and dry matter per day. Dry matter yield, dry matter percentage, leaf-stem ratio, and crude protein had weak or negative direct effects, indicating limited influence on total fodder yield. These results underscore the importance of selecting genotypes with high daily biomass accumulation to enhance fodder productivity, while traits like crude protein and leaf-stem ratio have minor contributions (Dewey and Lu, 1959; Singh and Chaudhary, 1979; Hallauer *et al.*, 2010).

## Conclusion

The study revealed substantial genetic variability among 34 maize genotypes for both grain and fodder traits. In dual-purpose maize, genotypes such as IC0335184 and BAUFM-123 exhibited superior grain yield, higher kernel weight, and favorable plant and ear traits, while in fodder trials, genotypes IC0335190, IC0335160, and IC0335184 recorded the highest green fodder yield, daily fodder accumulation, and dry matter yield. Correlation analysis indicated that key traits like plant height, ear traits, GFY per day, and dry matter yield were positively associated with overall productivity, with genotypic correlations stronger than phenotypic ones, highlighting the predominant influence of genetic factors. Path coefficient analysis further confirmed that GFY per day, days to 50% flowering, and plant height are the most critical traits for enhancing fodder yield, whereas crude protein and leaf–stem ratio have minor contributions. These findings suggest that indirect selection for high daily biomass accumulation, optimal flowering, and plant stature can effectively improve both grain and fodder yield in maize. Notably, genotype IC0335184 performed well under both dual-purpose and fodder objectives, making it a promising candidate for integrated maize breeding programs.

**Table 1:** Analysis of variance (mean sum of square) for seventeen characters of thirty four Maize (*Zea mays* L.) genotypes

| Sl. No | Source of variation | d.f | Days to 50% flow. | 50% Silking | Anthesis Silking Interval | 75% dry husk | Plant height (cm) | Ear Height (cm) | Number of ear per plant | Kernels per ear | Ear length | Ear diam-eter | Kernel weight (g) | Shelling % | Grain yield at 15% moisture | Grain Yield (g/plot) | Grain yield (q/ha) | Moist-ure % | Protein % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Rep. | 1 | 44.485 | 46.118 | 0.001 | 0.001 | 194.485 | 34.307 | 0.021 | 718.250 | 6.735 | 0.078 | 757.779 | 137.229 | 33.446 | 48,327.115 | 37.340 | 0.170 | 0.004 |
| 2. | Genotypes | 33 | 8.582** | 8.175** | 0.188** | 8.704* | 855.067** | 167.141** | 0.086** | 1011.425** | 3.079** | 0.194** | 379.409** | 32.045* | 43.730** | 12096.778* | 9.334* | 2.177** | 0.706** |
| 3. | Error | 33 | 3.152 | 3.269 | 0.007 | 4.4 | 80.173 | 5.628 | 0.01 | 193.553 | 0.861 | 0.03 | 104.022 | 14.151 | 8.422 | 5,632.935 | 4.348 | 0.037 | 0.032 |
| 4. | S Em± | | 1.255 | 1.278 | 0.059 | 1.483 | 6.331 | 1.677 | 0.071 | 9.838 | 0.656 | 0.122 | 7.212 | 2.660 | 2.052 | 53.0704 | 1.474449 | 0.136 | 0.126 |
| 5. | C.D at 5% | | 3.612 | 3.679 | 0.175 | 4.268 | 18.217 | 4.827 | 0.206 | 28.305 | 1.888 | 0.35 | 20.75 | 7.653 | 5.904 | 152.696 | 4.242 | 0.391 | 0.361 |

** Significant at 1 % and *Significant at 5 % level of significance

**Table 2:** Analysis of variance (mean sum of square) for nine yield attributing characters

| Sl. No. | Source of variation | d.f | Days to 50% flowering | Plant height | Green fodder yield (q/ha) | Green fodder yield (q/ha/day) | Dry matter yield | Dry matter yield (q/ha/day) | Dry matter yield (%) | Leaf stem ratio | Crude Protein (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Replication | 1 | 0.529 | 74.132 | 353.309 | 0.262 | 10.578 | 0.010 | 0.007 | 0.006 | 0.106 |
| 2. | Genotypes | 33 | 10.665** | 549.027** | 1290.252* | 0.801** | 135.711** | 0.074** | 7.092** | 0.007** | 4.545** |
| 3. | Error | 33 | 2.135 | 46.590 | 604.066 | 0.286 | 29.227 | 0.017 | 0.554 | 0.001 | 0.008 |
| 4. | S Em± | | 1.033 | 4.826 | 17.379 | 0.378 | 3.823 | 0.092 | 0.526 | 0.022 | 0.063 |
| 5. | C.D at 5% | | 2.973 | 13.887 | 50.004 | 1.088 | 10.999 | 0.263 | 1.514 | 0.068 | 0.184 |

** Significant at 1 % and *Significant at 5 % level of significance

**Table 3:** Mean performance of genotypes for grain yield and yield attributing characters

| Entries | Days to 50% flowering | 50% silking | Anthesis Silking Interval | 75% Dry Husk | Plant Height (cm) | Ear ht (cm) | No. of ears per Plant | Kernels per Ear | Ear Length (cm) | Ear Diameter (cm) | Kernel Weight (g) | Shelling % | Grain yield at 15% moisture | Grain yield (g/plot) | Grain yield (q/ha) | Moisture % | Protein % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BAUFM-122 | 51.5 | 55.00 | 3.50 | 98.79 | 171.60 | 47.00 | 1.35 | 275 | 14.7 | 2.95 | 205 | 82.8 | 36.24 | 940.0 | 26.11 | 13.9 | 9.85 |
| BAUFM-123 | 51.5 | 55.00 | 3.50 | 100 | 174.90 | 41.30 | 1.45 | 305 | 15.55 | 3.15 | 212 | 84.1 | 42.53 | 932.8 | 25.91 | 12.1 | 9.05 |
| IC0335188 | 49.5 | 53.50 | 4.00 | 95.89 | 181.30 | 31.20 | 1.05 | 200 | 13.25 | 2.55 | 174 | 77.15 | 30.23 | 850.0 | 23.61 | 12.1 | 8.45 |
| IC0335202 | 50.5 | 53.50 | 3.00 | 92.745 | 183.50 | 54.75 | 1.6 | 220 | 13.7 | 2.35 | 174 | 72 | 31.355 | 835.0 | 23.195 | 11.95 | 9.1 |
| IC0335189 | 50.5 | 54.00 | 3.50 | 94.59 | 162.00 | 31.50 | 1.45 | 232 | 14.7 | 2.45 | 178 | 70.65 | 33.41 | 732.5 | 20.345 | 12.95 | 8.65 |
| IC0335193 | 48 | 51.50 | 3.50 | 91.835 | 182.50 | 29.45 | 1.2 | 232 | 11.9 | 2.5 | 174 | 70.6 | 37.58 | 762.7 | 21.185 | 12.2 | 8.7 |
| BAUFM-124 | 47.5 | 51.00 | 3.50 | 93.525 | 173.30 | 42.50 | 1.25 | 222.5 | 13.6 | 2.6 | 203 | 70.95 | 35.91 | 816.65 | 22.685 | 12.6 | 8.25 |
| IC0335199 | 47.5 | 51.00 | 3.50 | 92.845 | 161.80 | 30.85 | 1 | 241 | 13.3 | 2.6 | 185 | 75.8 | 38.68 | 851.95 | 23.67 | 14.05 | 8.75 |
| IC0335196 | 45 | 49.00 | 4.05 | 91.49 | 176.20 | 44.00 | 1.3 | 270 | 14.55 | 3.1 | 198.5 | 79.2 | 37.74 | 885.4 | 24.59 | 12.15 | 9.25 |
| IC0335192 | 51.5 | 55.50 | 4.00 | 94.825 | 188.90 | 45.50 | 1.1 | 258.5 | 14.25 | 2.65 | 181.5 | 72.3 | 35.915 | 810.0 | 22.5 | 12.95 | 9.15 |
| IC0335198 | 48 | 51.50 | 3.50 | 94.825 | 189.40 | 35.50 | 1.6 | 250 | 13.4 | 2.55 | 188 | 79.2 | 33.225 | 824.5 | 22.9 | 11.5 | 7.7 |
| IC0335201 | 50 | 53.50 | 3.50 | 97.92 | 181.70 | 31.50 | 1 | 233.5 | 13.6 | 2.65 | 175 | 79.6 | 41.34 | 785.15 | 21.81 | 11.1 | 8.65 |
| IC0335172 | 48.5 | 52.50 | 4.05 | 93.345 | 143.90 | 36.00 | 1.05 | 256.5 | 12.2 | 2.6 | 179 | 71.7 | 28.225 | 772.2 | 21.45 | 12.15 | 7.8 |
| IC0335159 | 48.5 | 52.00 | 3.50 | 94.92 | 144.90 | 27.00 | 1 | 252.5 | 12.2 | 2.75 | 173.5 | 74.5 | 26.595 | 687.3 | 19.095 | 10.8 | 8.1 |
| IC0335164 | 46 | 50.00 | 4.05 | 92.64 | 140.00 | 26.50 | 1 | 245 | 13.15 | 2.65 | 169 | 73 | 26.99 | 728.0 | 20.22 | 11.4 | 9.1 |
| IC0335173 | 45.5 | 49.50 | 4.00 | 92.95 | 208.80 | 24.50 | 1 | 230 | 11.1 | 2.35 | 167.5 | 68.8 | 27.67 | 710.0 | 19.72 | 10.6 | 9.05 |
| IC0335191 | 45 | 48.50 | 3.50 | 91.84 | 152.70 | 27.50 | 1 | 238 | 13.6 | 2.75 | 168.5 | 70.5 | 33.785 | 693.0 | 19.25 | 11.3 | 7.95 |
| IC0335162 | 45.5 | 49.00 | 3.50 | 93.405 | 146.90 | 27.50 | 1 | 243.5 | 14.05 | 2.5 | 193.5 | 76.7 | 28.275 | 797.4 | 22.15 | 11.65 | 8.75 |
| IC0335184 | 46 | 49.50 | 3.50 | 95.025 | 131.90 | 21.75 | 1.7 | 312.5 | 15.5 | 3.05 | 220 | 85.3 | 43.375 | 945.85 | 26.275 | 10.85 | 8.05 |
| IC0335190 | 46 | 49.50 | 3.50 | 93.68 | 133.40 | 25.00 | 1 | 254 | 13.7 | 2.45 | 173 | 70.95 | 31.8 | 743.4 | 20.65 | 10.75 | 7.95 |
| IC0335175 | 46 | 49.50 | 3.50 | 93.18 | 135.30 | 27.00 | 1 | 227.5 | 10.8 | 2.25 | 165 | 76.65 | 30.565 | 704.0 | 19.555 | 11.4 | 9.1 |
| IC0335161 | 47 | 50.50 | 3.50 | 94.35 | 164.80 | 26.85 | 1 | 250 | 11.2 | 2.25 | 171.5 | 72.9 | 29.36 | 685.3 | 19.035 | 11.25 | 8.8 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IC0335169 | 45.5 | 49.50 | 4.00 | 92.46 | 139.20 | 25.30 | 1 | 262 | 11.7 | 3.15 | 173.5 | 76.7 | 33.975 | 762.45 | 21.18 | 11.75 | 8.7 |
| IC0335177 | 46 | 49.00 | 3.00 | 93.005 | 153.60 | 21.80 | 1 | 233 | 13.2 | 3.2 | 174 | 77.4 | 32.88 | 695.75 | 19.325 | 10.5 | 9.15 |
| IC0335178 | 45.5 | 49.00 | 3.50 | 92.675 | 126.30 | 22.50 | 1 | 244.5 | 12.85 | 2.35 | 166 | 73.6 | 32.465 | 720.15 | 20.005 | 12.5 | 9.05 |
| IC0335176 | 47 | 50.50 | 3.50 | 94.975 | 148.90 | 25.25 | 1 | 255 | 12.55 | 2.65 | 180 | 78 | 34.185 | 689.55 | 19.155 | 10.95 | 8.85 |
| IC0335194 | 46 | 50.00 | 4.00 | 92.765 | 141.00 | 26.45 | 1 | 265 | 15.05 | 2.5 | 168.5 | 74.4 | 31.19 | 704.15 | 19.56 | 10.1 | 9.1 |
| IC0335160 | 45.5 | 49.00 | 3.50 | 92.5 | 168.20 | 22.75 | 1 | 244 | 11.7 | 3.15 | 179 | 78.25 | 26.04 | 687.3 | 19.095 | 11.65 | 7.85 |
| IC0335195 | 46.5 | 50.50 | 4.00 | 93.835 | 152.40 | 30.65 | 1.15 | 262.5 | 13.1 | 3.3 | 169 | 78.6 | 29.795 | 805.0 | 22.36 | 13.6 | 8.65 |
| IC0335170 | 47.5 | 51.00 | 3.50 | 97.805 | 138.20 | 28.00 | 1 | 243.5 | 14.7 | 2.85 | 170 | 78.5 | 40.235 | 756.15 | 21.005 | 11.1 | 9.15 |
| SUWAN | 46 | 50.00 | 4.00 | 93.085 | 127.40 | 23.40 | 1.15 | 243 | 12.95 | 2.9 | 175 | 76.2 | 36.82 | 860.55 | 23.905 | 12.1 | 8.8 |
| IC0335131 | 44 | 48.00 | 4.00 | 91.305 | 169.00 | 54.20 | 1.1 | 255 | 13.7 | 2.6 | 174 | 76.8 | 27.96 | 810.4 | 22.515 | 11.1 | 8.8 |
| African Tall (NC) | 46 | 50.00 | 4.00 | 94.49 | 217.10 | 21.80 | 1 | 270 | 14.7 | 3.35 | 185 | 77.6 | 33.415 | 835.45 | 23.21 | 10.35 | 10.25 |
| J1006 (NC) | 47 | 51.00 | 4.00 | 96.55 | 178.50 | 27.00 | 1.3 | 280 | 13.9 | 2.95 | 195 | 75.8 | 37.15 | 866.8 | 24.08 | 13.9 | 9.9 |
| Overall Mean | 47.279 | 50.94 | 3.66 | 94.12 | 161.46 | 31.29 | 1.141 | 250.191 | 13.356 | 2.725 | 180.515 | 75.8 | 33.438 | 784.906 | 21.803 | 11.803 | 8.778 |
| C. D. 5% | 3.612 | 3.679 | 0.175 | 4.268 | 18.217 | 4.827 | 0.206 | 28.305 | 1.888 | 0.35 | 20.75 | 7.653 | 5.904 | 87.338 | 2.378 | 0.391 | 3.612 |
| S.E.± | 1.255 | 1.278 | 0.059 | 1.483 | 6.331 | 1.677 | 0.071 | 9.838 | 0.656 | 0.122 | 7.212 | 2.660 | 2.052 | 30.355 | 0.826 | 0.136 | 0.126 |
| C.V | 3.755 | 3.549 | 2.348 | 2.229 | 5.59 | 7.583 | 8.879 | 5.561 | 6.948 | 6.315 | 5.65 | 4.963 | 8.679 | 6.139 | 6.012 | 1.629 | 2.024 |

**Table 4:** Mean performance of genotypes for yield and yield attributing characters

| Entries | Days to 50% flowering | Plant Height (cm) | Green Fodder Yield (q/ha) | Green Fodder Yield (q/ha/day) | Dry Matter Yield (q/ha) | Dry Matter Yield (q/ha/day) | Dry matter yield (%) | Leaf Stem Ratio | Crude Protein (%) |
|---|---|---|---|---|---|---|---|---|---|
| BAUFM-122 | 50.50 | 183.65 | 447.50 | 8.85 | 93.50 | 1.85 | 21.00 | 0.70 | 10.65 |
| BAUFM-123 | 51.50 | 180.30 | 410.00 | 7.96 | 73.25 | 1.42 | 17.88 | 0.82 | 11.41 |
| IC0335188 | 48.00 | 164.40 | 362.50 | 7.56 | 84.15 | 1.76 | 23.20 | 0.74 | 10.89 |
| IC0335202 | 49.50 | 179.25 | 362.50 | 7.32 | 66.56 | 1.34 | 18.35 | 0.68 | 12.46 |
| IC0335189 | 47.00 | 172.60 | 392.50 | 8.36 | 83.07 | 1.77 | 21.18 | 0.57 | 10.93 |
| IC0335193 | 47.00 | 162.30 | 372.50 | 7.93 | 82.95 | 1.76 | 22.28 | 0.55 | 12.46 |
| BAUFM-124 | 46.00 | 187.50 | 357.50 | 7.77 | 83.30 | 1.81 | 23.33 | 0.62 | 11.98 |
| IC0335199 | 45.00 | 192.90 | 387.50 | 8.62 | 86.63 | 1.93 | 22.35 | 0.66 | 12.55 |
| IC0335196 | 46.50 | 182.50 | 380.00 | 8.21 | 83.70 | 1.81 | 22.00 | 0.69 | 9.02 |
| IC0335192 | 50.50 | 184.10 | 382.50 | 7.57 | 95.45 | 1.89 | 25.00 | 0.71 | 8.99 |
| IC0335198 | 46.00 | 179.50 | 382.50 | 8.32 | 95.27 | 2.07 | 24.90 | 0.73 | 9.33 |
| IC0335201 | 49.00 | 181.40 | 422.50 | 8.62 | 102.35 | 2.09 | 24.23 | 0.58 | 12.19 |
| IC0335172 | 46.00 | 182.20 | 372.50 | 8.09 | 89.18 | 1.94 | 24.00 | 0.70 | 9.69 |
| IC0335159 | 46.00 | 186.30 | 432.50 | 9.40 | 85.92 | 1.87 | 19.88 | 0.66 | 10.23 |
| IC0335164 | 47.00 | 160.10 | 380.00 | 8.09 | 85.65 | 1.82 | 22.48 | 0.61 | 8.06 |
| IC0335173 | 45.00 | 180.80 | 385.00 | 8.56 | 83.34 | 1.86 | 21.63 | 0.63 | 10.35 |
| IC0335191 | 44.00 | 154.30 | 360.00 | 8.18 | 89.69 | 2.04 | 24.95 | 0.61 | 12.55 |
| IC0335162 | 42.50 | 141.20 | 372.50 | 8.77 | 77.20 | 1.82 | 20.73 | 0.62 | 12.31 |
| IC0335184 | 43.00 | 137.40 | 360.00 | 8.37 | 74.75 | 1.74 | 20.75 | 0.61 | 9.72 |
| IC0335190 | 43.50 | 149.40 | 455.00 | 10.47 | 91.40 | 2.10 | 20.10 | 0.57 | 9.90 |
| IC0335175 | 43.50 | 142.80 | 390.00 | 8.97 | 85.45 | 1.97 | 21.90 | 0.70 | 10.80 |
| IC0335161 | 45.50 | 170.40 | 387.50 | 8.52 | 86.15 | 1.89 | 22.23 | 0.62 | 8.84 |
| IC0335169 | 44.50 | 153.40 | 377.50 | 8.49 | 92.70 | 2.08 | 24.55 | 0.69 | 8.66 |
| IC0335177 | 43.50 | 147.40 | 405.00 | 9.31 | 93.27 | 2.14 | 23.03 | 0.59 | 12.55 |
| IC0335178 | 44.50 | 147.50 | 357.50 | 8.03 | 86.76 | 1.95 | 24.25 | 0.63 | 8.51 |
| IC0335176 | 44.50 | 159.00 | 387.50 | 8.71 | 92.34 | 2.08 | 23.85 | 0.59 | 10.38 |
| IC0335194 | 45.50 | 152.20 | 377.50 | 8.30 | 86.20 | 1.90 | 22.83 | 0.64 | 8.45 |
| IC0335160 | 47.00 | 170.00 | 420.00 | 8.94 | 108.66 | 2.31 | 25.85 | 0.67 | 10.41 |
| IC0335195 | 49.00 | 143.50 | 387.50 | 7.91 | 93.11 | 1.90 | 24.03 | 0.59 | 12.08 |
| IC0335170 | 48.50 | 138.20 | 362.50 | 7.50 | 79.67 | 1.65 | 21.98 | 0.63 | 11.95 |
| SUWAN | 48.50 | 164.90 | 357.50 | 7.37 | 84.62 | 1.74 | 23.70 | 0.60 | 8.63 |
| IC0335131 | 46.00 | 160.60 | 385.00 | 8.38 | 94.52 | 2.06 | 24.55 | 0.62 | 10.56 |
| African Tall (NC) | 48.50 | 177.10 | 412.50 | 8.50 | 97.68 | 2.01 | 23.70 | 0.60 | 12.46 |
| J1006 (NC) | 47.50 | 181.40 | 402.50 | 8.47 | 92.61 | 1.95 | 23.05 | 0.59 | 8.18 |
| Overall Mean | 46.47 | 166.19 | 387.87 | 8.37 | 87.68 | 1.89 | 22.64 | 0.64 | 10.53 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C. D. (5%) | 2.973 | 13.887 | 50.004 | 1.088 | 10.999 | 0.263 | 1.514 | 0.068 | 0.184 |
| S Em± | 1.033 | 4.826 | 17.379 | 0.378 | 3.823 | 0.092 | 0.526 | 0.022 | 0.063 |
| C.V (%) | 3.145 | 4.107 | 6.337 | 6.394 | 6.166 | 6.839 | 3.288 | 5.138 | 0.863 |

**Table 5:** Estimation of genotypic (g) and phenotypic (p) correlation among different yield attributing trait

| Sl. No. | Characters | Basis | Days to 50% flowering | 50% silking | ASI | 75% Dry husk | Plant height | Ear height | Ear per plant | Kernel per ear | Ear length | Ear Diameter | Kernel Weight | Shelling (%) | Grain yield at 15% moisture | Grain Yield | Grain yield (q/ha) | Moisture (%) | Protein (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | **Days to 50% flowering** | G | **1.000** | 0.945** | -0.308* | 0.961*** | 0.521** | 0.588** | 0.528** | -0.083 | 0.512** | -0.071 | 0.518** | 0.143 | 0.532** | 0.364** | 0.373** | 0.507** | 0.130 |
| | | P | **1.000** | 0.980** | -0.206 | 0.541** | 0.360** | 0.396** | 0.331** | 0.026 | 0.172 | -0.111 | 0.138 | 0.081 | 0.21 | 0.168 | 0.183 | 0.355** | 0.065 |
| 2. | **50% silking** | G | | **1.000** | -0.138 | 0.994** | 0.568** | 0.613** | 0.532** | -0.061 | 0.544** | -0.014 | 0.516** | 0.179 | 0.525** | 0.416** | 0.421** | 0.545** | 0.184 |
| | | P | | **1.000** | -0.085 | 0.551** | 0.360** | 0.400** | 0.294* | 0.06 | 0.169+ | -0.104 | 0.134 | 0.058 | 0.194 | 0.171 | 0.187 | 0.375** | 0.082 |
| 3. | **ASI** | G | | | **1.000** | -0.183 | 0.056 | -0.005 | -0.232 | 0.234 | 0.042 | 0.235 | -0.073 | -0.063 | -0.164 | 0.095 | 0.089 | 0.117 | 0.221 |
| | | P | | | **1.000** | -0.114 | 0.044 | 0.002 | -0.189 | 0.203 | -0.022 | 0.182 | -0.072 | -0.042 | -0.124 | 0.12 | 0.115 | 0.105 | 0.213 |
| 4. | **75% Dry Husk** | G | | | | **1.000** | 0.344** | 0.073 | 0.391** | 0.575** | 0.646** | 0.294* | 0.975** | 0.993** | 0.832** | 0.955** | 0.961** | 0.221 | 0.348** |
| | | P | | | | **1.000** | 0.183 | 0.115 | 0.202 | 0.236 | 0.331** | 0.178 | 0.203 | 0.377** | 0.347** | 0.414** | 0.427** | 0.161 | 0.184 |
| 5. | **Plant Height** | G | | | | | **1.000** | 0.469** | 0.406** | 0.002 | 0.335** | 0.191 | 0.443** | 0.059 | 0.250* | 0.455** | 0.452** | 0.192 | 0.291* |
| | | P | | | | | **1.000** | 0.466** | 0.254* | -0.005 | 0.217 | 0.185 | 0.237 | 0.15 | 0.143 | 0.328** | 0.331** | 0.174 | 0.258* |
| 6. | **Ear Height** | G | | | | | | **1.000** | 0.492** | -0.012 | 0.348** | -0.145 | 0.377** | 0.01 | 0.109 | 0.236 | 0.246* | 0.366** | 0.109 |
| | | P | | | | | | **1.000** | 0.402** | 0.014 | 0.275* | -0.096 | 0.211 | 0.052 | 0.075 | 0.179 | 0.191 | 0.354** | 0.091 |
| 7. | **Ear per plant** | G | | | | | | | **1.000** | 0.475** | 0.551** | 0.144 | 0.801** | 0.522** | 0.503** | 0.678** | 0.679** | 0.308* | -0.078 |
| | | P | | | | | | | **1.000** | 0.271* | 0.432** | 0.077 | 0.539** | 0.238 | 0.378** | 0.517** | 0.519** | 0.265* | -0.041 |
| 8. | **Kernel per Ear** | G | | | | | | | | **1.000** | 0.702** | 0.643** | 0.864** | 0.910** | 0.401** | 0.816** | 0.809** | 0.043 | 0.245* |
| | | P | | | | | | | | **1.000** | 0.351** | 0.471** | 0.472** | 0.426** | 0.401** | 0.615** | 0.620** | 0.036 | 0.139 |
| 9. | **Ear Length** | G | | | | | | | | | **1.000** | 0.411** | 0.865** | 0.731** | 0.780** | 1.032 | 0.987** | 0.120 | 0.292* |
| | | P | | | | | | | | | **1.000** | 0.295* | 0.419** | 0.279* | 0.405** | 0.464** | 0.475** | 0.090 | 0.231 |
| 10. | **Ear Diameter** | G | | | | | | | | | | **1.000** | 0.512** | 0.824** | 0.329** | 0.643** | 0.643** | 0.100 | 0.22 |
| | | P | | | | | | | | | | **1.000** | 0.316** | 0.491** | 0.285* | 0.526** | 0.525** | 0.062 | 0.198 |
| 11. | **Kernel Weight** | G | | | | | | | | | | | **1.000** | 0.936** | 0.749** | 0.918** | 0.929** | 0.354** | 0.078 |
| | | P | | | | | | | | | | | **1.000** | 0.414** | 0.442** | 0.645** | 0.646** | 0.238 | 0.059 |
| 12. | **Shelling%** | G | | | | | | | | | | | | **1.000** | 0.765** | 0.987** | 0.995** | 0.013 | 0187 |
| | | P | | | | | | | | | | | | **1.000** | 0.317** | 0.554** | 0.554** | 0.044 | 0.145 |
| 13 | **Grain Yield at 15% moisture** | G | | | | | | | | | | | | | **1.000** | 0.687** | 0.680** | 0.273* | 0.255* |
| | | P | | | | | | | | | | | | | **1.000** | 0.602** | 0.602** | 0.209 | 0.153 |
| 14. | **Grain Yield(g/plot)** | G | | | | | | | | | | | | | | **1.000** | 1 | 0.231 | 0.284* |
| | | P | | | | | | | | | | | | | | **1.000** | 0.998** | 0.128 | 0.187 |
| 15. | **Grain yield (q/ha)** | G | | | | | | | | | | | | | | | **1.000** | 0.244* | 0.296* |
| | | P | | | | | | | | | | | | | | | **1.000** | 0.142 | 0.198 |
| 16. | **Moisture%** | G | | | | | | | | | | | | | | | | **1.000** | 0.163 |
| | | P | | | | | | | | | | | | | | | | **1.000** | 0.160 |
| 17. | **Protein%** | G | | | | | | | | | | | | | | | | | **1.000** |
| | | P | | | | | | | | | | | | | | | | | **1.000** |

**Table 6:** Partitioning of Correlation into direct and indirect effects by path analysis considering grain yield as dependent variable

| Chara-cters | Basis | Days to 50% flowering | Days to 50% silking | 75% dry husk | Plant height (cm) | Ear height | Ear per plant | Kernel per ear | Ear length | Ear diameter | Kernel weight | Shelling % | Grain yield at 15% moisture | Moisture % | Protein % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Days to 50 % flowering | G | **2.390** | -1.702 | -0.203 | -0.117 | 0.090 | -0.006 | -0.086 | -0.192 | -0.068 | 0.334 | -0.192 | 0.379 | -0.275 | 0.021 |
| | P | **-0.279** | 0.192 | 0.094 | 0.054 | 0.011 | 0.071 | 0.006 | -0.005 | -0.019 | 0.027 | 0.008 | 0.047 | -0.025 | 0.002 |
| Days to 50% silking | G | 2.419 | **-1.681** | -0.197 | -0.127 | 0.094 | -0.006 | -0.063 | -0.204 | -0.013 | 0.333 | -0.240 | 0.374 | -0.296 | 0.030 |
| | P | -0.274 | **0.195** | 0.096 | 0.054 | 0.011 | 0.063 | 0.013 | -0.005 | -0.018 | 0.026 | 0.006 | 0.044 | -0.026 | 0.002 |
| 75% dry husk | G | 2.441 | -1.671 | **-0.199** | -0.077 | 0.011 | -0.004 | 0.593 | -0.242 | 0.284 | 0.628 | -1.331 | 0.593 | -0.120 | 0.057 |
| | P | -0.151 | 0.108 | **0.173** | 0.027 | 0.003 | 0.044 | 0.052 | -0.010 | 0.030 | 0.039 | 0.039 | 0.078 | -0.011 | 0.005 |
| Plant height (cm) | G | 1.244 | -0.955 | -0.068 | **-0.224** | 0.072 | -0.005 | 0.002 | -0.126 | 0.184 | 0.285 | -0.080 | 0.178 | -0.104 | 0.047 |
| | P | -0.101 | 0.070 | 0.032 | **0.149** | 0.013 | 0.055 | -0.001 | -0.006 | 0.031 | 0.046 | 0.016 | 0.032 | -0.012 | 0.007 |
| Ear height (cm) | G | 1.405 | -1.030 | -0.014 | -0.105 | **0.153** | -0.006 | -0.012 | -0.131 | -0.139 | 0.243 | -0.014 | 0.077 | -0.199 | 0.018 |
| | P | -0.111 | 0.078 | 0.020 | 0.069 | **0.028** | 0.087 | 0.003 | -0.008 | -0.016 | 0.041 | 0.005 | 0.017 | -0.025 | 0.003 |
| Ear per plant | G | 1.262 | -0.895 | -0.078 | -0.091 | 0.075 | **-0.011** | 0.489 | -0.207 | 0.139 | 0.517 | -0.700 | 0.358 | -0.167 | -0.013 |
| | P | -0.092 | 0.057 | 0.035 | 0.038 | 0.011 | **0.216** | 0.060 | -0.013 | 0.013 | 0.104 | 0.025 | 0.085 | -0.019 | -0.001 |
| Kernel per ear | G | -0.199 | 0.103 | -0.114 | -0.000 | -0.002 | -0.005 | **1.030** | -0.264 | 0.620 | 0.557 | -1.219 | 0.285 | -0.023 | 0.040 |
| | P | -0.007 | 0.012 | 0.041 | -0.001 | 0.000 | 0.058 | **0.220** | -0.010 | 0.080 | 0.091 | 0.044 | 0.090 | -0.003 | 0.004 |
| Ear length | G | 1.224 | -0.915 | -0.128 | -0.075 | 0.053 | -0.006 | 0.724 | **-0.375** | 0.396 | 0.558 | -0.979 | 0.555 | -0.065 | 0.048 |
| | P | -0.048 | 0.033 | 0.057 | 0.032 | 0.008 | 0.093 | 0.077 | **-0.029** | 0.050 | 0.081 | 0.029 | 0.091 | -0.006 | 0.007 |
| Ear diameter | G | -0.170 | 0.023 | -0.058 | -0.043 | -0.022 | -0.002 | 0.663 | -0.154 | **0.965** | 0.330 | -1.105 | 0.234 | -0.054 | 0.036 |
| | P | 0.031 | -0.020 | 0.031 | 0.028 | -0.003 | 0.017 | 0.104 | -0.009 | **0.169** | 0.061 | 0.051 | 0.064 | -0.004 | 0.006 |
| Kernel weight | G | 1.238 | -0.868 | -0.194 | -0.099 | 0.058 | -0.009 | 0.890 | -0.325 | 0.494 | **0.645** | -1.255 | 0.534 | -0.192 | 0.013 |
| | P | -0.038 | 0.026 | 0.035 | 0.035 | 0.006 | 0.116 | 0.104 | -0.012 | 0.053 | **0.193** | 0.043 | 0.099 | -0.017 | 0.002 |
| Shelling % | G | 0.343 | -0.301 | -0.197 | -0.013 | 0.002 | -0.006 | 0.937 | -0.274 | 0.795 | 0.603 | **-1.341** | 0.544 | -0.007 | 0.030 |
| | P | -0.023 | 0.011 | 0.065 | 0.022 | 0.001 | 0.051 | 0.094 | -0.008 | 0.083 | 0.080 | **0.104** | 0.071 | -0.003 | 0.004 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grain yield at 15% moisture | G | 1.272 | -0.882 | -0.165 | -0.056 | 0.017 | -0.006 | 0.413 | -0.293 | 0.317 | 0.483 | -1.025 | **0.712** | -0.148 | 0.041 |
| | P | -0.059 | 0.038 | 0.060 | 0.021 | 0.002 | 0.082 | 0.088 | -0.012 | 0.048 | 0.086 | 0.033 | **0.224** | -0.015 | 0.004 |
| Moisture% | G | 1.211 | -0.917 | -0.044 | -0.043 | 0.056 | -0.004 | 0.044 | -0.045 | 0.096 | 0.228 | -0.017 | 0.194 | **-0.542** | 0.027 |
| | P | -0.099 | 0.073 | 0.028 | 0.026 | 0.010 | 0.057 | 0.008 | -0.003 | 0.011 | 0.046 | 0.005 | 0.047 | **-0.070** | 0.005 |
| Protein% | G | 0.311 | -0.309 | -0.069 | -0.065 | 0.017 | 0.001 | 0.252 | -0.110 | 0.213 | 0.050 | -0.250 | 0.181 | -0.088 | **0.163** |
| | P | -0.018 | 0.016 | 0.032 | 0.038 | 0.003 | -0.009 | 0.031 | -0.007 | 0.034 | 0.011 | 0.015 | 0.034 | -0.011 | **0.029** |
| G= genotypic, P= phenotypic*,** = significant at p = 0.05 and 0.01 respectively | | | | | | | | | | | | | Residual | G = 0.5291, P= 0.2506 | |

**Table 7:** Estimation of genotypic (g) and phenotypic (p) correlation among different yield attributing traits .

| Sl. No. | Characters | Basis | Green fodder yield | Days to 50% flowering | Plant height | Green fodder yield (q/ha/day) | Dry matter yield | Dry matter yield (q/ha/day) | Dry matter yield (%) | Leaf stem ratio | Crude protein (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | **Green fodder yield** | G | **1.000** | 0.162 | 0.459** | 0.684** | 0.314** | 0.221 | -0.229 | 0.119 | 0.072 |
| | | P | **1.000** | 0.177 | 0.162 | 0.790** | 0.560** | 0.431** | -0.209 | -0.054 | 0.042 |
| 2. | **Days to 50% flowering** | G | | **1.000** | 0.546** | -0.608** | 0.036 | -0.439** | -0.051 | 0.433** | 0.092 |
| | | P | | **1.000** | 0.435** | -0.461** | 0.032 | -0.440** | -0.126 | 0.237 | 0.063 |
| 3. | **Plant height** | G | | | **1.000** | -0.060 | 0.190 | -0.092 | -0.058 | 0.349** | -0.015 |
| | | P | | | **1.000** | -0.134 | 0.089 | -0.125 | -0.035 | 0.320** | -0.015 |
| 4. | **Green fodder yield (q/ha/day)** | G | | | | **1.000** | 0.204 | 0.482** | -0.169 | -0.217 | -0.004 |
| | | P | | | | **1.000** | 0.472** | 0.651** | -0.125 | -0.197 | 0.003 |
| 5. | **Dry matter yield** | G | | | | | **1.000** | 0.881** | 0.851** | -0.205 | -0.134 |
| | | P | | | | | **1.000** | 0.882** | 0.690** | -0.138 | -0.110 |
| 6. | **Dry matter yield (q/ha/day)** | G | | | | | | **1.000** | 0.780** | -0.370** | -0.162 |
| | | P | | | | | | **1.000** | 0.669** | -0.220 | -0.125 |
| 7. | **Dry matter yield (%)** | G | | | | | | | **1.000** | -0.267* | -0.197 |
| | | P | | | | | | | **1.000** | -0.110 | -0.182 |
| 8. | **Leaf stem ratio** | G | | | | | | | | **1.000** | -0.157 |
| | | P | | | | | | | | **1.000** | -0.123 |
| 9. | **Crude protein (%)** | G | | | | | | | | | **1.000** |
| | | P | | | | | | | | | **1.000** |
| ** Significant at 1 % and * Significant at 5 % level of significance | | | | | | | | | | | |

**Table 8:** Partitioning of Correlation into direct and indirect effects by path analysis considering grain yield as dependent variable

| Characters | Basis | Days to 50 % flowering | Plant height (cm) | Green fodder yield (q/ha/day) | Dry matter yield | Dry matter yield (q/ha/day) | Dry matter yield% | Leaf stem ratio | Crude protein |
|---|---|---|---|---|---|---|---|---|---|
| Days to 50 % flowering | G | **1.027** | 0.033 | -0.682 | -0.010 | -0.201 | 0.006 | -0.009 | -0.001 |
| | P | **0.301** | 0.003 | -0.449 | 0.024 | 0.278 | 0.018 | 0.003 | -0.000 |
| Plant height (cm) | G | 0.561 | **0.060** | -0.067 | -0.052 | -0.042 | 0.007 | -0.007 | 0.000 |
| | P | 0.131 | **0.007** | -0.130 | 0.066 | 0.079 | 0.005 | 0.004 | 0.000 |
| Green fodder yield (q/ha/day) | G | -0.624 | -0.004 | **1.123** | -0.056 | 0.221 | 0.019 | 0.005 | 0.000 |
| | P | -0.139 | -0.001 | **0.974** | 0.352 | -0.411 | 0.017 | -0.002 | -0.000 |
| Dry matter yield | G | 0.037 | 0.011 | 0.229 | **-0.274** | 0.404 | -0.097 | 0.004 | 0.001 |
| | P | 0.010 | 0.001 | 0.459 | **0.746** | -0.557 | -0.097 | -0.002 | 0.000 |
| Dry matter yield (q/ha/day) | G | -0.451 | -0.005 | 0.541 | -0.242 | **0.458** | -0.089 | 0.008 | 0.001 |
| | P | -0.132 | -0.001 | 0.634 | 0.658 | **-0.632** | -0.094 | -0.003 | 0.000 |
| Dry matter yield % | G | -0.052 | -0.003 | -0.189 | -0.233 | 0.358 | **-0.114** | 0.006 | 0.001 |
| | P | -0.038 | -0.000 | -0.122 | 0.515 | -0.422 | **-0.140** | -0.001 | 0.000 |
| Leaf stem ratio | G | 0.445 | 0.021 | -0.244 | 0.056 | -0.170 | 0.030 | **-0.021** | 0.001 |
| | P | 0.071 | 0.002 | -0.192 | -0.103 | 0.139 | 0.015 | **0.012** | 0.000 |
| Crude protein | G | 0.094 | -0.001 | -0.004 | 0.037 | -0.074 | 0.022 | 0.003 | **-0.006** |
| | P | 0.019 | -0.000 | 0.003 | -0.082 | 0.079 | 0.026 | -0.001 | **-0.001** |
| G= genotypic, P= phenotypic, *,** = significant at p = 0.05 and 0.01 respectively | | | | | | Residual- G = 0.0020, P= 0.0149 | | | |

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