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**RESEARCH ARTICLE**

# CORRELATION AMONG YIELD AND YIELD COMPONENTS IN MAIZE (*Zea mays* L.)

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***Abstract***

Correlation coefficient analysis for yield and yield components was carried out using Ten maize varieties namely; ACR 97, TZL COMP1-SYN- W, SAMMAZ 11, SAMMAZ 14, SAMMAZ 17, 2004 SYN, 95 TZEE-W, SAMMAZ 13, EX-MICHIKA and TZE COMP 3DT and their $F_1$'s were evaluated in two locations of Yola and Mubi in Adamawa State, Nigeria, in 2010/2011 cropping season in a Randomized Complete Block Design with three replications. The result showed that both phenotypic and genotypic correlations identified ear height, weight of unshelled cob, length of unshelled cob, number of rows per cob and 100 grain weight to be the most reliable components of yield in maize which should be selected for the development of high yielding maize population.



## INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal crop after wheat and rice. It occupies a prominent position in global agriculture. Maize is a major staple food in developing countries like Nigeria and it is receiving much attention in industrial development and livestock nutrition. Its dry milling products include cornflakes, bread and pancake (Ogunbodebe, 2000). It is also used for Tuwo, Waina (Masa), Koko, "Brabusko", local beer called Burukutu, Ogi (porridge) in Yoruba, Agidi in Ibo (Abdulrahman, 1997; Ado *et al*, 2002). It is also used for producing alcoholic and non- alcoholic drinks. It is used as building material, fuel, medicinal and ornamental plant (Kumar, *et al.,* 2014). Due to a very wide utilization of maize, the main goal of all commercial maize breeding programs is to obtain new inbred and hybrids that will outperform the existing hybrids with respect to a number of traits particularly grain yield (Kumar *et al.,* 2014).

Grain yield is a complex quantitative trait that depends on a number of factors; hence the knowledge of the relationships between grain yield and its contributing components will improve the efficiency of breeding programs through the use of appropriate selection indices (Mohammadi *et al.,* 2003).

## MATERIALS AND METHODS

This research was carried out during the 2011 planting season in two locations of Yola and Mubi in Adamawa State, Nigeria. These areas lie within the Northern Guinea Savanna ecological zones of Nigeria (Adebayo and Tukur, 1992).

Ten maize varieties comprising of four (4) late maturing improved open pollinated varieties (OPV) of maize namely: TZL COMP-I-SYN-W, ACR 97 TZL COMP-1-W, SAMMAZ 11, SAMMAZ 14, a medium and four (4) early maturing improved open pollinated varieties (OPV) of maize namely SAMMAZ 17; 2004 SYN, 95 TZEE-

W and SAMMAZ 13 respectively developed at International Institute for Tropical Agriculture, IITA, Ibadan and Institute for Agricultural Research, IAR, Samaru, Zaria and one local early maturing variety obtained from Michika, Adamawa State, Nigeria were used for this research.

The ten varieties of maize were crossed in all possible combinations excluding the reciprocals to obtain progeny seeds ($F_1$s) in accordance to diallel mating designs, method II as described by Griffing, (1956), giving a total of 45 crosses [ n(n-1)/2 ]. All 45 crosses ($F_1$s) including the 10 parents were evaluated in a replication trial in two locations namely, ModibboAdama University of Technology (MAUTECH), Yola and Research and Demonstration Farm, Adamawa State University, Mubi during the 2011 rainy season. The treatments (parents and $F_1$s) were planted in a Randomized Complete Block Design (RCBD) with three replications in the two locations. There were 55 plots, each with an area of 10.125m$^2$ (4.5m x 2.25m). Three seeds were sown by hand per hole at a spacing of 0.75m x 0.50m and later thinned to two plants one week after sowing. NPK 15:15:15 fertilizer was applied in split dose at three weeks and seven weeks after planting (WAP) in the rate of 80 kg N/ha, 80 kg P/ha and 80 kg K/ha and top dressed using Urea during tasseling stage in the rate of 40 kg N/ha. Weeding was done three weeks and 7 weeks after sowing by hand weeding

The data collected for analyses were Number of ears, Plant height, Ear height, Ear length, Ear weight, Ear diameter, Number of rows per ear, Number of seeds per row per ear, Grain yield per hectare (kg/ha), 100 seed weight, Shelling percentage and Harvest index.

## RESULTS AND DISCUSSION

Grain yield/ha as extrapolated from grain yield/plant showed both highly significant and significant positive genotypic correlation with almost all the characters, number of cobs per plant, shelling percentage and harvest index.

In general, the genotypic coefficients of correlation were higher than the phenotypic coefficients. There are more significant genotypic associations between the different pairs of characters than the phenotypic correlation, indicating that the characters were more related genotypically than phenotypically. This could be attributed to environmental influence inherent in the phenotypic correlation (Kumar, *et. al*, 2014)

From the result of this study, it is interesting to note that all characters showed significant or highly significant positive correlation at genotypic level with yield except number of cob/plant, shelling percentage and harvest index. This indicates that any improvement in these characters with positive correlation with yield, simultaneously might lead to an increase in yield/ha or vice versa. This is in agreement with the findings of Inamullah *et al.* (2011); Badu-Apraku *et al*. (2006), Kamara *et al*. (2009),Handi *et al.* (2012) and Bello *et al*. (2010) in their various works which showed the associations of these characters in maize. In this study, only three characters namely, number of rows/cob and 100 grain weight; cob diameter showed significant and highly significant positive correlation, respectively with grain yield at both genotypic and phenotypic levels, indicating that these three characters are probably the most important yield characters. Selection for these three characters in maize population would most likely result in a phenomenal increase in the yielding ability of this maize population (Malik *et. al.,* (2005).

Table 14: Phenotypic (Upper Diagonal) and Genotypic (Lower Diagonal) Correlations between Yield and Yield Components.

| Traits | PHM | EHM | NCP | WUC | LUC | CDM | NRC | NSR | SPP | HDX | WHS | GYH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PHM | | 0.50** | 0.02 | 0.64** | 0.28 | 0.39* | -0.30* | 0.04 | 0.44* | -0.26 | 0.05 | -0.14 |
| EHM | 0.83** | | 0.55** | 0.54** | 0.22 | 0.45* | -0.12 | -0.01 | 0.15 | 0.19 | -0.16 | 0.05 |
| NCP | -0.02 | -0.05 | | 0.13 | 0.55** | 0.54** | 0.00 | -0.02 | 0.19 | -0.01 | -0.06 | -0.06 |
| WUC | 0.64** | 0.67** | 0.07 | | 0.53** | 0.53** | 0.24 | 0.01 | -0.33* | 0.10 | -0.06 | 0.01 |
| LUC | 0.63** | 0.67** | 0.12 | 0.90** | | 0.16 | -0.09 | 0.06 | -0.14 | 0.16 | -0.01 | 0.10 |
| CDM | 0.47* | 0.36* | 0.21 | 0.95** | 0.17 | | 0.09 | 0.02 | 0.32* | -0.14 | 0.29 | 0.54** |
| NRC | 0.32* | 0.15 | -0.07 | 0.40* | 0.19 | 0.50** | | 0.05 | 0.11 | 0.16 | 0.09 | 0.35* |
| NSR | 0.76** | 0.88** | -0.10 | 0.93** | 0.96** | 0.62** | 0.14 | | -0.04 | 0.13 | -0.02 | 0.03 |
| SPP | -0.14 | -0.29 | 0.09 | -0.09 | -0.49* | 0.26 | -0.05 | 0.10 | | 0.22 | 0.07 | 0.09 |
| HDX | -0.28 | -0.46* | 0.11 | -0.31* | -0.63** | 0.53** | -0.41* | -0.53** | 0.71** | | -0.08 | -0.10 |
| WHS | 0.52** | 0.42* | 0.07 | 0.84** | 0.32* | 0.57** | -0.23 | 0.31* | -0.52** | -0.20 | | 0.38* |
| GYH | 0.57** | 0.53** | 0.02 | 0.96** | 0.59** | 0.98** | 0.34* | 0.88** | 0.18 | -0.06 | 0.41* | |

*= Significant at (P=0.05) ** = Significant at (P=0.01)

| | | |
|---|---|---|
| PHM= Plant height at maturity | NRC= Number of rows per cob | HDX= Harvest index |
| EHM= Ear height at maturity | LUC= Length of unshelled cob | WHS= Weight of hundred seed per plot |
| NCP= Number of cobs per plant | CDM= Cob diameter | SPP= Shelling percentage per plant |
| WUC= Weight of unshelled cob | NSR= Number of seeds per row | GYH= Grain yield per hectare |

## CONCLUSION

The results of this study revealed a host of very vital genetic information which should be used in the improvement of maize population. The result of the correlation studies has also indicated that ear height, weight of unshelled cob, length of unshelled cob, number of rows per cob and 100 grain weight in maize plant were the most reliable characters to select for when breeding for higher yield. This could be used for the development of synthetic varieties for use in the national maize breeding programs in Nigeria.

## RECOMMENDATION

The study revealed a host of very vital genetic information which should be used in the improvement of maize population. This information should therefore not be allowed to waste away but be utilized effectively in the improvement of high yielding varieties of maize for the benefit of the Nigerian maize farmer. More research is however needed to confirm and also compliment some of the findings in this research.

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