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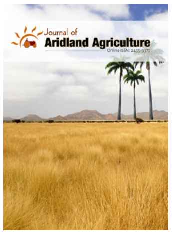

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Estimation of yield traits & correlation in *Zea mays*

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ABSTRACT

Seven *Zea mays* genotypes were planted at two sites Aleppo and Edleb which are research centres belongs to the General Commission of Scientific Agricultural research GCSAR northern Syria. Yield traits (ear diameter, ear length, row number per ear^{-1}, grain number per ear^{-1}, thousand grain weight) were studied in order to estimate the variation between genotypes and to between sites and to select the best genotypes concerning studied yield traits to be applied in maize breeding programs. Results showed that all Studied genotypes of maize had significant differences in yield traits in which both genotypes (Z 263, Z 67) were remarkable in all studied traits like thousand grain weight (391.7, 390.7) g for each of them respectively. Results also revealed that most studied traits were significantly superior in Aleppo comparing to Edleb. Results of correlation showed positively and significantly relations between all studied traits except between each of row number per ear^{-1} and grain number per ear^{-1} with thousand grain weight.

KEYWORDS: Yield traits, zea maize, genotypes, sites, primitive correlation

INTRODUCTION

Maize (*Zea mays* L.) belongs to *poaceae* family and considered as one of the most important cereal crops in the world after rice and wheat [1], used as food, feeds, fuel [2] and also for industrial purposes [3]. Genetic variability among maize genotypes offers effective selection [4].The most used traits of maize are related to ear and grain characteristics [5]. ear traits is essential for improving breeding program [6]. [1] estimated genetic parameters of seven newly developed maize hybrids and one composite variety at the Research Farm, JNKVV Jabalpur during the year 2012-2013 in India, his analysis of variance revealed high significant difference among genotypes for all studied traits such as grain row per cob, grains per cob and cob length and they found significant positive correlation between grain per cob and Rows per cob, and cob length was significantly and positively correlated with each of thousand grain weight and row number. [7] evaluated 36 private and public maize hybrids during autumn season of 2016 at the Main Agricultural Research Station, University of Agricultural Sciences in India, yield traits showed significant difference among the private hybrids such as cob length, number of rows per cob and 100 seed weight, and cob length was correlated significantly and positively with each of thousand grain weight and row number per cob. [8] found significant differences in ear traits like ear diameter, ear length, ear row number when he studied the genetic variations among seventy-nine maize Germplasm for ear traits of Turkish local maize (*Zea mays* L.) genotypes from northern part of Turkey, his correlation results showed positive and significant correlation between each of ear diameter with ear length, ear diameter with row number per ear^{-1}, ear length with grain per ear^{-1} and row number per ear^{-1} with grain per ear^{-1}. [9] study the assessment of quantitative genetic variability and character association in maize at field experimental centre of department of genetics and plant breeding (SHUATS) in India and their results showed significant differences to all quantitative characters like cob length, grain rows per cob, 100 seed weight, they found significant positive correlation between cob length and rows per cob, and they found that cob length and rows number per cob^{-1} were significantly and positively correlated. [10] evaluated 45 purple waxy corn lines developed from exotic and domestic Germplasm in the autumn season 2014 at Crop Research and Development Institute of Vietnam National University of Agriculture, They found significant differences in yield traits like ear length, ear diameter, and thousand grain weight. Previous study [11] showed considerable amount of significant variation between studied genotypes of maize for ear length, number of grain per ear and thousand grain weight, and ear length was positively correlated with grain number per ear, and they found positive and significant correlation between ear length and grain number per ear^{-1}. Another research [12] evaluated the Seed yield performance of different maize (*Zea mays* L.) genotypes under agro climatic conditions at Research Farm of the University of Haripur in Pakistan in season 2015, results revealed significant differences for various parameters studied in which Rows number per ear ranged from the lowest 13.6 to the highest 15.6, and grain number per ear ranged from 424.3 to 531.3, and greater thousand grains weight was 330 g while Lower thousand grains weight was 265g. [2] evaluated maize genotypes to determine the best irrigation practice for maize crop under subtropical condition of Natore, Bangladesh during Rabi season in 2013-2014, their results showed significant differences for cob length, grains per cob, grain line cob, thousand grain weight. [13] reported significant differences for length, and with [14], and also [15] reported significant variation for quality traits in Maize.

Objectives of this study were to estimate the variation between genotypes and to evaluate locations effects on them and to select the best genotypes concerning studied yield traits to be applied in maize breeding programs.

MATERIAL AND METHODS

Seven *Zea mays* genotypes (collected and conserved from different provinces in Syria) were planted at two research centres Aleppo and Edleb which are belongs to the General Commission of Scientific Agricultural research GCSAR northern Syria during summer 2011under irrigation regime, the experiment was laid out in a Complete Randomized Block Design (RCBD) with three replications, each genotype was planted in tow rows of six meter length, and 70 cm space was left between rows, depth of planting was 3-5 cm. All recommended cultural practices like irrigation, Fertilization and pesticides were conducted according to Agricultural ministry guides, following traits were studied from ten selected plants after harvest then means was recorded according to [16]:

- Ear diameter (cm): Measured at the central part of the uppermost ear.
- Ear length(cm):Measured without the peduncle length.
- Row number per ear $^{-1}$: Rows were counted in the whole ear.
- Grain number per ear^{1}: All grains in ear were counted.
- Thousand grain weight (g): adjusted to 10% moisture content 500 grain were weighted and adjusted to thousand grain weight.

Analysis of variance (ANOVA) was held using Genestat.12 program, and Multiple comparisons between means were performed using L.S.D (significance level 5%). Correlation between traits was analysed using SPSS15.

RESULTS AND DISCUSSION

Analysis of variance showed significant differences between genotypes in all studied traits and also between sites for only ear diameter and ear length and thousand grain weight (Table 1).

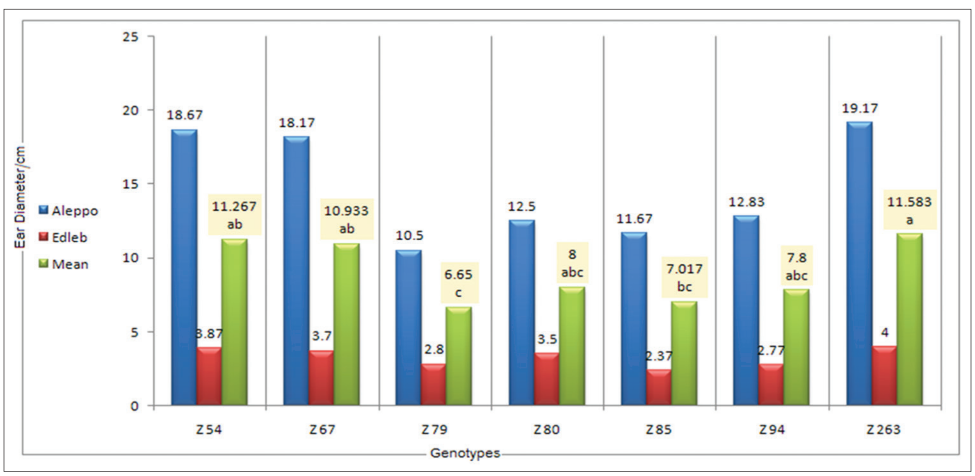

Figure 1. Ear diameter/cm in studied genotypes

Table 1: Variance analysis of traits in studied genotypes

Source of variance		Mean of squares				
	d.f.	ED	EL	GNE	RNE	THGW
Genotype	6	27.44 ^{S}	16.211 ^{S}	32674 ^{S}	20.19 ^{S}	36162 ^{S}
Site	1	1388.63 ^{S}	111.720 ^{S}	19520 ^{NS}	27.20 ^{NS}	127932 ^{S}
Genotype×Site	6	15.18 ^{S}	5.194 ^{S}	6195 ^{S}	17.14^{S}	8014 ^{S}
L.S.D 5% Genotype		4.266	3.540	161.8	4.840	68.21
L.S.D 5% Site		2.280	1.892	86.5	2.587	36.46
L.S.D 5% G×S		6.033	5.006	228.8	6.845	96.46
CV%		39.8	16.6	31.8	30.9	18.7

Where: d.f. Degree of freedom, S: significant at 5% . ED=Ear diameter, EL=Ear length, GNE=Grain number per ear^{1}, RNE=Row number per ear^{1,} THGW=Thousand grain weight.

Where: d.f. Degree of freedom, S: significant at 5%. ED = Ear diameter, EL= Ear length, GNE= Grain number per ear^{1}, RNE= Row number per ear^{1}, THGW= Thousand grain weight.

Ear diameter was ranged from 6.650 cm for the genotype Z79 to 11.583 cm for the genotype Z 263, with significant differences, while grand mean for all genotypes was 9.04 cm (Table 2). Results showed that the genotype Z263 were significantly superior in ear diameter comparing to both genotypes Z 79, Z 85 which was (6.650, 7.017) cm respectively for each of them due to the genetic variation between them (Figure 1). Significant difference was found between two sites Aleppo and Edleb in ear diameter which was higher in Aleppo (Figure 6). These results are in agreement with results of [8] and [10] and [15].

Ear length was ranged from 15.85 cm for the genotype Z94 to 19.95 cm for the genotype Z 54, with significant differences, while grand mean for all genotypes was 17.94 cm (Table 2). Results showed that the genotype Z 54 were significantly superior in ear length comparing to both genotypes Z 80, Z 94 which was (16.40, 15.85) cm respectively for each of them due to the genetic variation(Figure 2). Significant difference was found between two sites Aleppo and Edleb in ear length in which was higher in Aleppo 19.57 comparing to 16.31 cm in Edleb (Figure 6). Our results agree with results of [10] and [11] and [13] and [15].

Grain number per ear $^{-1}$ had significant differences were found between genotypes, Grand mean was 428 grain which ranged from the lowest number 319.2 grain in genotype Z80 to the highest number 518.8 grain in genotype Z 263 (table 2). Genotype Z 263 was significantly superior in grain number per ear 518.5 grain comparing to both genotypes Z 80, Z 85 (319.2, 340.3) cm respectively for each of them (figure 3), there were no significant differences between two sites Aleppo and Edleb in grain number per ear (407, 450) grain(figure 6). Our results are in agreement with results of [11] and [12] and [13] and [15].

Row number per ear $^{-1}$ ranged from the lowest (10.95) row in Z85 to the largest number (16.02) row in Z263, Grand mean was 13.20 row (Table 2). Genotype Z 263 was significantly superior in grain number per ear 518.5 grain comparing only to genotype Z85 (Figure 4), there were no other significant difference between genotypes or even between two sites in row number per ear (Figure 6). Our results agree with findings of [12] and [15].

Thousand grain weight was also distinguished with significant differences between genotypes in which ranged from the lowest 211 g in genotype Z79 to the highest 391.7 g in genotype Z263, grand mean for all genotypes in both sites was 307.1 g (Table 2). Both genotypes (Z263, Z67) were significantly superior in thousand grain weight (391.7, 390.7) g respectively for each of them comparing to most genotypes (Z79, Z85, Z94, Z54) which was (211, 227.8, 254, 306.7) g respectively for each of them (Figure 5). Thousand grain weight was significantly superior at Aleppo comparing to Edleb (362.3, 251.9)g respectively (Figure 6). These results agree with results of [10] and [11] and [12] and [15].

Table 2: Means of Studied Traits in both Sites

	Genotype	Aleppo	Edleb	Mean
Ear Diameter cm	Z 54	18.67	3.87	11.267 ab
	Z 67	18.17	3.70	10.933 ab
	Z 79	10.50	2.80	6.650 c
	Z 80	12.50	3.50	8.000 abc
	Z 85	11.67	2.37	7.017 bc
	Z 94	12.83	2.77	7.800 abc
	Z 263	19.17	4.00	11.583 a
	Mean	14.79	3.29	9.04
Ear Lcmength	Z 54	23.00	16.90	19.95 a
	Z 67	20.33	17.60	18.97 abc
	Z 79	18.33	17.57	18.97 abc
	Z 80	17.33	15.47	16.40 bc
	Z 85	18.33	15.23	16.78 abc
	Z 94	17.33	14.37	15.85 c
	Z 263	22.33	17.03	19.68 ab
	Mean	19.57	16.31	17.94
Grain number per Ear $^{-1}$	Z 54	464.	462.	463.0 abc
	Z 67	438.	438.	438.0 abc
	Z 79	450.	525.	487.7 ab
	Z 80	243.	396	319.2 c
	Z 85	303.	378.	340.3 bc
	Z 94	449.	411.	430.1 abc
	Z 263	499.	538.	518.8 a
	Mean	407.	450.	428.
Row number per Ear $^{-1}$	Z 54	17.00	12.80	14.90 ab
	Z 67	15.67	11.47	13.57 ab
	Z 79	11.33	13.67	12.50 ab
	Z 80	10.67	11.90	11.28 ab
	Z 85	10.67	11.23	10.95 b
	Z 94	13.33	12.97	13.15 ab
	Z 263	19.33	12.70	16.02 a
	Mean	14.00	12.39	13.20
Thousand Grain Weight g	Z 54	320.0	293.3	306.7 bc
	Z 67	448.0	333.3	390.7 a
	Z 79	256.7	165.3	211.0 d
	Z 80	498.3	237.3	367.8 ab
	Z 85	263.0	192.7	227.8 d
	Z 94	300.0	208.0	254.0 cd
	Z 263	450.0	333.3	391.7 a
	Mean	362.3	251.9	307.1

Table 3: Correlation between Studied Traits

	ED	EL	GNE	RNE	ThGW
ED	1				
EL	0.757**	1			
GNE	0.194*	0.518**	1		
RNE	0.592**	0.674**	0.810**	1	
ThGW	0.570**	0.330**	_0.124	0.136	1

* significant at 0.05, ** significant at 0.01, ED ear diameter, EL ear length, GNE grain number per ear ear^{1}, RNE row number per ear ear^{1}, ThGW thousand grain weight.

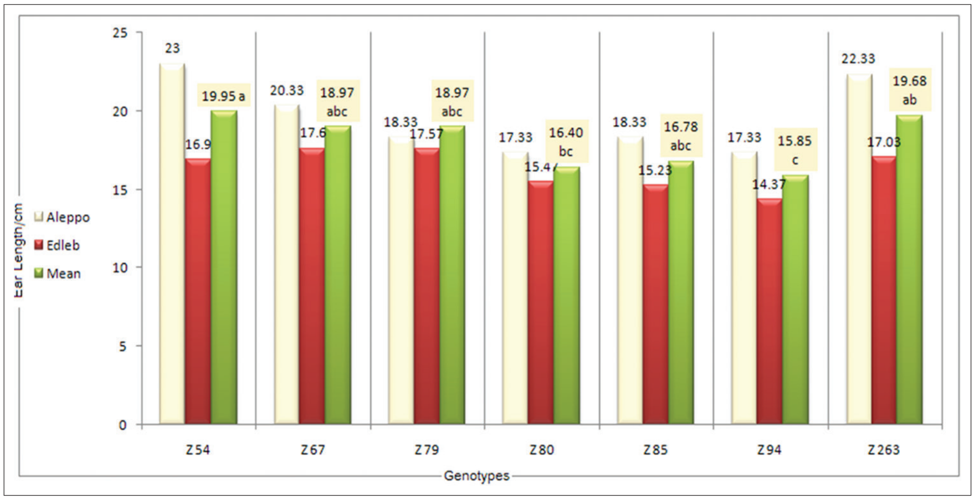

Figure 2. Ear length/cm in studied genotypes

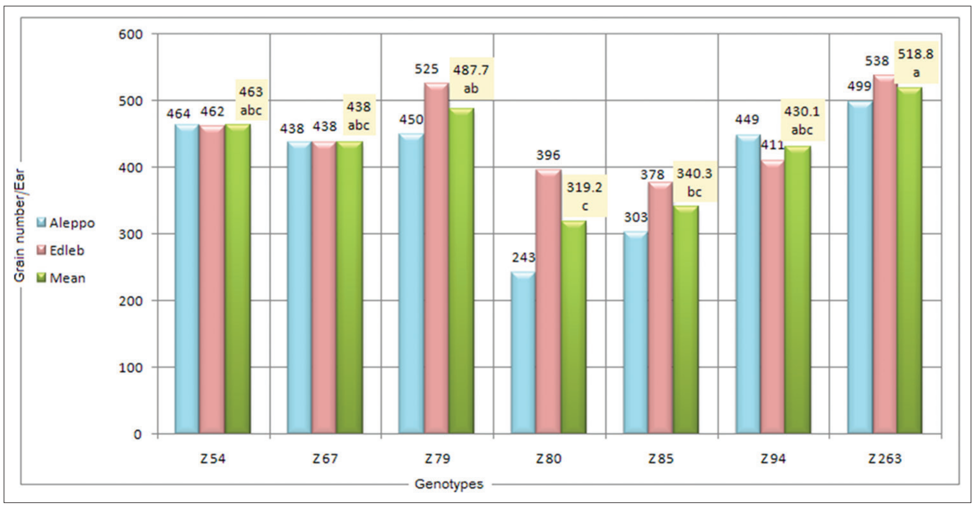

Figure 3. Grain number/ear[1] in studied genotypes

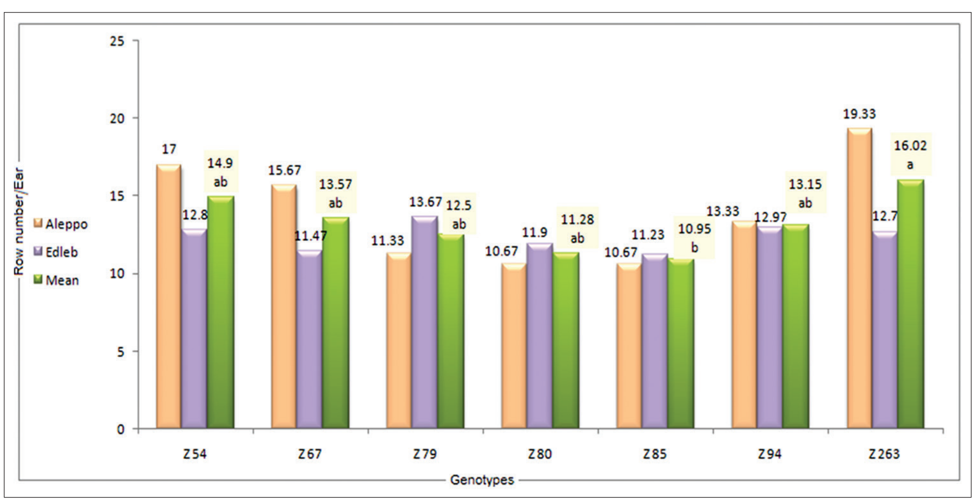

Figure 4. Row number/ear[1] in studied genotypes

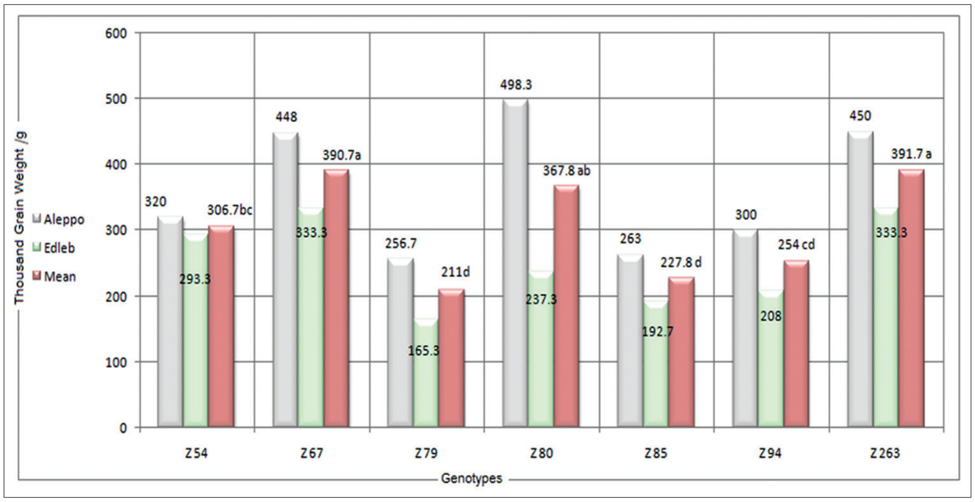

Figure 5. Thousand grain weight/g in studied genotypes

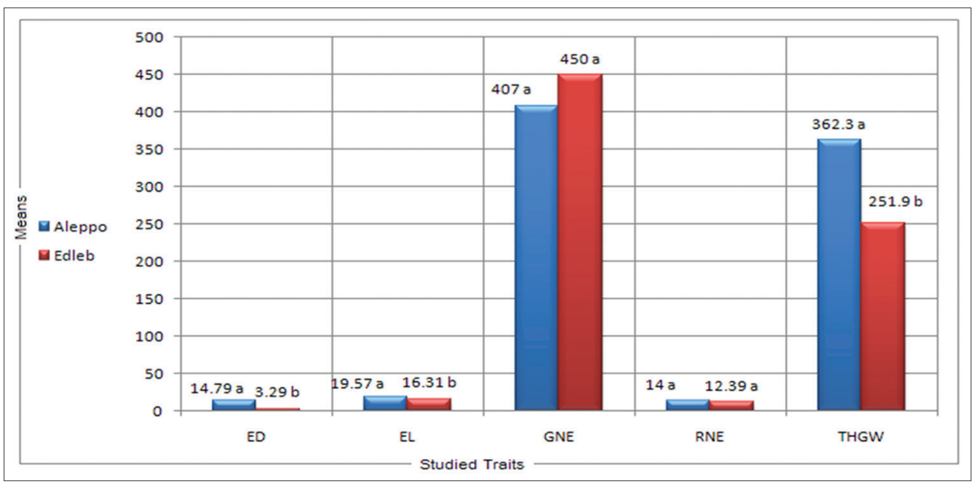

Figure 6. Mean of Studied traits in both sites

CORRELATION

Ear diameter was positively and significantly correlated with each of ear length (r = 0.757**), grain number per ear[1] (r = 0.194*), row number per ear[1] (r = 0.592**), and thousand grain weight (r = 0.570**). Ear length was also positively and significantly correlated with each of grain number per ear[1] (r = 0.518**), row number per ear[1] (r = 0.674**), and thousand grain weight (r = 0.330**), also positive and significant correlation was found between grain number per ear[1] and row number per ear[1] (r = 0.810**) (Table 3). These results are in agreement with [1], [7], [8], [9] and [11].

CONCLUSION

Studied genotypes of maize had significant differences in yield traits in which both genotypes (Z 263, Z 67) were remarkable genotype in all studied traits, and also the genotype Z 80 was noTable in three yield traits.Most traits were significantly superior in Aleppo comparing to Edleb. All traits were significantly and positively correlated except row number per ear -[1] with thousand grain weight.

RECOMMENDATION

Utilize the studied genotypes in maize breeding programs and to keep evaluating the valuable diversity found in maize genotypes.

AUTHOR CONTRIBUTIONS

All authors had an equal contributions.

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