Identifying Some Sweet Maize Inbred Lines by Using Some Growing Parameters

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***Abstract*:** *The study was conducted at Selcuk University Agriculture Faculty Crop Science Department in Konya/Turkey during 2013. Seeds obtained from 38 sweet maize inbred lines belong to S5 used that have been improved by S.U.A.F. Crop science Department faculty members. Lumina and Merit hybrid maize varieties were used as standards. The study was conducted according to "Augmented Experimental Design" as four blocks at S.U.A.F. Crop Science Department Prof. Abdulkadir AKCIN experimental area. When at the blocks all inbred lines were exemplify with an unrepeated line, standard hybrid maize varieties were repeated at all blocks. Tasseling time, silking, first ear height, stem thickness, leaf angle, and plant leaf number values used to determine growing parameters of lines. All analyses were done at 5 plants at all lines and standards during tasseling time. Sweet maize inbred lines tasseling times varied between 82,67 (4.27.3) days to 60,67 (4.14.1) days, silking duration ranged from 89 days (4.11.3) to 41 days (4.26.4). It was recorded that first ear height values changed 64, 10 cm (4.25.1) to 34,10 cm (4.17.3). Sweet maize inbred lines stem thickness values varied between 2,39 cm (4.13.1) to 1,07 cm (4.4.3), leaf angle values changed 69,14 ° (4.6.3) to 19,14 ° (4.4.3). Plant leaf number values were changed 12,76 (4.13.1) to 6,74 (4.14.1). As a result of the study a lot of morphological and phenological characteristics of lines were determined comparatively with hybrid maize varieties, at this way an important variation is detected with all of those identified parameters. It can be told that those lines can be source of successful hybrid maize varieties in the future.*

Keywords: *Sweet Maize, Inbred Lines, Growth Parameters, Augmented Experimental Design*

1. Introduction

Maize is important for human and animal nutrition because of it's rich nutrient include. It is also important for animal feeding and source for sugar base starch and oil industry. Maize that is produced in Turkey is consumed in Turkey. Because of livestock production development and intensive agriculture, demand of maize is increased day by day. Maize production values increased each day also according to use of hybrid maize seeds [1]. One of the ways to improve yield in agriculture is developing high yield potential varieties and to use plant genetic potential maximum by cultural precautions. In our country potential agricultural areas limited so it is not possible to increase amount of area harvested. So obtaining high yield values can be possible only with increasing yield potential maximum [2][3]. Obtaining high yield potential and varieties superior properties, maize breeding studies must be go on. Identifying genetic differences between parent lines in order to get high heterosis in obtaining hybrid cultivars in open-pollinated plants like maize is very important. Because of this, breeders develop source populations from different heterotic groups and perform crossbreeding among these populations [4]. To improve sturdy hybrid maize varieties, it is necessary to improve strong lines. Aim of this study is determination of sturdy lines by identifying lines phenologic and morphologic properties by using growing parameters.

2. Materials and Methods

2.1. Materials

At the project seeds belong to 38 sweet maize inbred lines obtained from S5 stub lines whose inbreeding programs have been going on, developed by Prof. Bayram SADE and Prof. Süleyman SOYLU from Selcuk University Agriculture Faculty Crop Science Department Konya/Turkey were used. In addition to these materials Lumina and Merit hybrid maize varieties used as standards.

2.2. Methods

The study was conducted at S.U.A.F. Crop Science Department Prof. Abdulkadir AKCIN experimental area as four blocks according to "Augmented Experimental Design". The trials were settled down for a year during 2013 Konya, Turkey. Konya plain is located middle and south parts of middle Anatolian zone. The plain is rounded by Bozdağ and Obruk plateau from north and north east, inner parts of Toros Mountains at south, Eregli plain at east, Takkeli, Gevele and Loras mountains at west. Konya plain is 80 km from North to South, 50 km from West to East. The most western point of plain is 32°20'La, the eastern point is 37°06'Lo. The endpoint of North is 38°08'N, South is 37°06'N [5]. Also each line were represented unrepeated as a row, standard hybrid maize varieties took part repeatedly at each block. The soil of experimental area was treated, weeds were removed mechanically and seed bed was prepared. Seeds obtained from inbred lines were sowed at the second week of May. Each inbred line was sowed by hand to 5 m rows. Between of rows was set as 70 cm, between of plants was set 25 cm. The experimental area was fertilized according to soil analyses results as 18 kg/da N and 11 kg/da P_2O_5. 4 kg of N and all of P [DAP (16 N–46 P_2O_5)] were treated with sowing. Rest of N was treated during second weed control and progressive developing stages at the form of ammonium nitrate (33 % N). Blocks were designed with 1 m intervals. The observations and measurements that were done at inbred lines were summarized below.

Observations and Measurements

To obtain lines growing parameters, measurements below done according to [6] and [1].

1. **Tasseling time (day)**
   50% of plants at each block tasseling duration since sowing recorded.

2. **Silking (day)**
   50% of plants at each block silking duration since sowing recorded.

3. **First ear height (cm)**
   Distance from soil surface to first ear was measured at five plants of each row during tasseling time and recorded.

4. **Stem thickness (mm)**
   It is detected with a stick from first node nearby soil surface at five plants of row during tasseling time.

5. **Ear leaf angle (°)**
   Angle between stem and ear leaf was measured by a protractor at five plants of row during tasseling time.

6. **Plant leaf number**
   Leaf number of five plants at each row was counted during tasseling time.

2.3. Statistical Analyses and Assessment

Variances obtained from research were analyzed according to "Augmented Experimental Design" with Jump 5.0.1 program. Variance analysis table of control groups, corrected terms of lines and corrected values of lines were tabulated.

3. Result and Discussion

3.1. Tasseling time

Variance analysis results of control varieties were given at Table 1. The longest tasseling time of varieties was obtained from Merit with value of 64,33 days, Lumina followed this with 63 days.

When values obtained from lines evaluated it is observed that longest tasseling time obtained from 14.20 coded line with 83 days, minimum tasseling time values were obtained from 14.34 and 14.35 coded lines with 71 days. Other lines tasseling times changed between those two values.

TABLE I: Variance Analysis Table of Control Varieties Tasseling Time

Variation Source	Degree of Freedom	Sum of Square	Mean of Square	F
Between Blocks	2	26,33	13,165	2,6629
Between Control Varieties	2	394,13	197,065	39,8563
Variety	36	558,96	15,527	3,1403
Error	3	14,83	4,94	-
General	43	994,25	230,697	-

When lines compared to control varieties it is observed that 4.24.3 (69,67 days), 4.1.2 (65,17 days), 4.27.3 (82,67 days), 4.4.3 (81,17 days) and 4.21.1 (79,67 days) coded maize inbred lines get higher values than Merit (64,33 day) who has the highest value of control group. General values obtained from lines and control groups change between 60,67 and 82,67 days. [7] reported that tasseling time values change between 41,0-52,3 days at the study that was conducted with inbred maize lines.

3.2. Silking duration

Variance analysis table of control varieties Table 2 was given below. The longest silking value of control group was obtained from Merit with 73,67 days, Lumina followed this with 71,67 days.

TABLE II: Variance Analysis Results of Silking Duration Belong To Control Varieties

Variation Source	Degree of Freedom	Sum of Square	Mean of Square	F
Between Blocks	2	26,33	13,165	2,6629
Between Control Varieties	2	394,13	197,065	39,8563
Variety	36	558,96	15,527	3,1403
Error	3	1,50	0,500	-
General	43	980,92	226,257	-

When values obtained from lines it is observed that the longest silking was obtained from 14.27 coded line with 89 days, minimum silking was obtained from 3.7, 13.34, 14.35 coded liens with 81 days. 4.11.3 (89 days) coded line gained standard varieties significantly by silking with 89 days. 4.6.4 coded line became fourth with 63 days, the lowest values of the group were 4.14.1 and 4.26.2 with 41 days. Values obtained from standards and lines were changed between 89 and 41 days. Silking is important for fertilization and grain formation. Sweet maize varieties are classified as early maturing, normal early maturing and late maturing time varieties. It is reported that silking depends on variety and sowing time. Environmental factors, sowing density, nitrogen douse are also effective on this parameter [8].

3.3. First ear height

Variance analysis values of first ear height were given at Table 3. The highest first ear height value of control varieties of study was obtained from Lumina with value of 48,69 cm. Merit followed this with value of 57,78 cm.

TABLE III: Variance Analysis Table Of Control Varieties First Ear Height Values

Variation Source	Degree of Freedom	Sum of Square	Mean of Square	F
Between Blocks	2	60,90	30,450	4,3333
Between Control Varieties	2	209,39	104,695	221,2355
Variety	36	1689,67	46,935	98,4329
Error	3	318,59	106,197	-
General	43	2278,55	347,538	-

When values obtained from lines evaluated it is observed that 14.26 coded line has the highest first ear height value with 86,50 cm. 3.8 and 14.21 coded lines followed it with of 80,90 cm and 77,50 cm. When values obtained from lines compared to control varieties it is observed that 4.25.1(64,10 cm), 4.24.3(61,10 cm) and 4.13.1(59,56 cm) coded lines gained both control varieties significantly and got highest values. General values

of first ear height of lines and varieties changed between 64,10 cm and 34,10 cm. Ear height is very important especially from agricultural mechanization way. Being close to soil surface of main ear makes harvest difficult. Being ear to top parts of plant cause lying of plant especially variety whose stem is weak [9].

3.4. Stem thickness

Variance analysis results are given Table 4 below. Highest stem thickness obtained from control varieties is 1, 82 cm from Merit and Lumina followed it with value of 1,64. When values obtained from lines evaluated it is observed that highest stem thickness value was obtained from 14.35 coded line with 2,32 cm. 14.21 and 14.30 coded lines followed this value with 2,29 cm and 2,19 cm respectively.

TABLE IV: Variance Analysis Table Of Control Varieties Stem Thickness Values

Variation Source	Degree of Freedom	Sum of Square	Mean of Square	F
Between Blocks	1	0,2089	0,2089	2809*
Between Control Varieties	2	0,1172	0,0586	586,1*
Variety	30	1,9825	0,0660	660,8*
Error	1	0,0001	0,0001	-
General	34	2,3087	0,3336	-

*Differences between varieties became important level of 5%.

The lowest values of group were obtained from 3.7 and 14.16 coded lines with 1,06 cm and 0.84 cm. When lines compared to controls it is observed that 4.13.1 (2,39 cm), 4.5.2 (2,09 cm) and 4.25.1 (2,03 cm) coded lines gained Merit significantly who has highest stem thickness value (1,82 cm) of control group. Lumina gained 4.26.4 (1,21 cm), 4.4.1(1,11 cm) and 4.4.3 (1,07 cm) coded lines significantly with 1,64 cm according to stem thickness parameter. General values obtained from controls and lines for this parameter changed between 2,39 cm 1,07 cm. At a study that was conducted with similar genotypes at the same environmental conditions by [10] stem thickness values of lines changed between 2,05 cm and 2,2 cm, of hybrids changed between 2,15 cm and 2,44 cm.

3.5. Leaf angle

Variance analysis table of control varieties was given below (Table 5). Highest leaf angle value of control group was obtained from Lumina with 48,78°, Merit followed it with 45,75°.

TABLE V: Variance Analysis Table of Control Varieties Leaf Angle Values

Variation Source	Degree of Freedom	Sum of Square	Mean of Square	F
Between Blocks	2	24,00	12,001	0,4364
Between Control Varieties	2	20,99	10,496	0,3817
Variety	36	2199,97	61,110	2,2221
Error	3	82,50	27,501	-
General	43	2327,47	111,109	-

When values obtained from lines evaluated, it is observed that highest leaf angle value was obtained from 14.5, 14.34 and 14.35 coded lines with 49°, the lowest leaf angle value was obtained from 14.9 coded line with 23°. When lines compared to controls it is observed that 4.6.3 (69,14°), 4.4.1 (61,64°) and 4.26.2 (58,10°) coded varieties gained Lumina (48,78°) who has highest leaf angle value. 4.22.1 (39,1°), 4.27.1 (37,1°) and 4.4.3(19,14°) coded lines formed last third values of group by leaf angle value, falling behind Lumina (48,78°) and Merit(45,75°). General values of lines and controls changed between 19,14° and 69,14°. [11] reported that; at the study that was conducted to observed genetic structure, and evaluate yield and yield components of some maize varieties in Adana; a lot of properties like ear number, leaf angle, grain yield are affected by a lot of genetic factors like additive gene effects.

3.6. Plant leaf number

Variance analysis table of control group was given below (Table 6). The highest plant leaf number value was obtained from Lumina with 10,24. Merit followed this value with 9,77.

TABLE VI: Variance Analysis Table of Control Varieties Plant Leaf Number Values

Variation Source	Degree of Freedom	Sum of Square	Mean of Square	F
Between Blocks	2	1,77	0,884	0,1765
Between Control Varieties	2	4,18	2,091	0,0655
Variety	36	37,33	1,037	0,1469
Error	3	0,81	0,270	-
General	43	44,09	4,282	-

When values obtained from lines evaluated it is observed that highest leaf number value was obtained from 14.21 coded line with 12,15, 14.29 (12,15) and 14.3(11,85) coded lines followed it. Lines above gained control varieties according to plant leaf number values. Plant leaf numbers of other lines changed between those values. When lines compared to control varieties it is observed that 4.13.1 (12,76), 4.12.2 (10,56) and 4.1.5 (10,36) coded lines gained Lumina (6,74) who has the highest value by this parameter. 4.17.2 (7,07), 4.5.2 (6,76) and 4.14.1 (6,74) coded lines have lower plant leaf number value than Merit (9,77) who has the lowest leaf number value of control varieties. Values obtained for this parameter changed between 12,76 and 6,74. [12] reported that leaf number changes between 10,5 and 15,8 for sugar maize. Values obtained from this research are compatible with those researchers' values.

4. Acknowledgements

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