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Correlation and Path Coefficients Analysis between Morphological Characteristics and Conservable Grain Yield of Sweet and Super Sweet Corn (*Zea Mays* L. *var. Saccharata*) Varieties

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

In order to evaluate the effects of planting methods on morphological traits, yield and yield components of sweet and super sweet corn varieties, an experiment was conducted at Khorasan Razavi Agricultural and Natural Resources Research center, Mashhad, Iran in 2012. In this research three planting method (one row raised bed, two row raised bed and furrow planting), sweet corn varieties (Chase, Temptation, KSC403su and Challenger), was laid out in factorial design based on randomized complete block design with three replications. The results of this study showed that different planting methods had significant effects on morphological traits such as plant height, ear height, ear leaf area, relative growth rate, 1000-grain weight, ear diameter, number of ear per plant, grain depth, conservable grain yield and plant harvest index at the P<.01 level. Moreover, results showed that different varieties had significant differences among traits such as the number

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of ear per plant, ear diameter, grain percentage, cob percentage, 1000-grain weight, conservable grain yield and harvest index. The results of correlation coefficient analysis also indicate highly significant correlation between conservable grain yield and all measured traits except for plant height, ear height, relative growth rate, ear diameter, and the number of ear per plant at the P<.01 level. The results of stepwise regression method analysis and path coefficient showed that conservable grain yield was affected by three traits of 1000-grain weight, ear diameter and number of ear per plant. Furthermore, these three traits indicate high and significant regression coefficient on conservable grain yield, respectively. Results of path coefficient analysis indicated that all traits positively affect conservable grain yields. Therefore, the measured traits like 1000-grain weight, ear diameter and the number of ear per plant had the highest direct effect on conservable grain yield. According to this study, selection for 1000-grain weight, ear diameter and number of ear per plant can led to improve conservable grain yield.

Keywords: Planting method; conservable grain yield; correlation and path coefficient analysis; stepwise method.

1. INTRODUCTION

Sweet corn (*Zea mays L. Var Saccharata*) is a highly nutritional and valuable vegetable crop, and it is used for fresh or conservable food products [1]. It is one of the popular vegetables for the American, Asian and European peoples have been increasingly tending to use this product [2]. Increasing demand and importance of sweet corn has led to a dramatical increase in sweet corn cultivating lands. In coordination with growth rate of industrial agriculture through the world and considering great cultivation potential and high compatibility of this plant with different climates and its vast cultivation value in tropical and subtropical climates, Iran has increased its cultivation. Considering the existing time gap after cessation of winter's rainfall with the next planting in autumn, it is required to select suitable plants with short cultivation periods (about 80-90 days), in order to optimize application of two planting periods. According to the conducted studies, the method of two-row raised bed planting had superiority to the planting method of one-row raised bed in Iran [3]. Most of researchers found that the two rows raised bed planting method with constant density was better than one-row raised bed planting method on yield [4]. Suitable cropping pattern via appropriate distribution of light in plant canopy led to increase in amount of energy. For instance, when the space between rows is decreased and at the same time the space between plants is increased, constant density of yield would increase because of getting lighter [5]. Sprague and Dudley reported that grain yield in two-row raised bed planting method was more than the one-row planting method [6]. Results of the experiment showed that grain yield had significant positive correlation with some traits such as number of grain per ear, 1000-grain weight, ear weight and ear height [7]. Result of the research made by Nasrolah Alhossini indicated that positive and significant correlation between two variables of conservable grain yield and harvest index, Anthesis silking interval under saline conditions. Also, there was negative correlation between grain yield and traits of the number of ear per plant, ear cob diameter [1,8]. Results of a number of researches and studies show that there is a significant positive correlation between grain yield and the plant height, ear height, ear diameter, ear cob diameter, number of rows per grain, number of grain per ear, 1000-grain weight [7,9,10]. Therefore, these traits have considerable importance for the increase in grain yield on maize hybrids [9]. The results of field experiments determined that relationship between yield and 300-grain weight, number of row per grain, number of grain per row, ear diameter, and number of ear per plant can be used as an important yield component for the plant breeders [9]. Also, other researches indicates that traits such as number of row per grain, number of grain per ear and 1000- grain weight have a positive direct effect on grain yield [10,11]. Evaluating of simple correlations between grain yield and yield components showed a significant and positive result [12]. Result of regression analysis shows significant positive direct and indirect effects on traits such as the ear length, number of grain per row, number of row per grain and 1000-grain weight in comparison with other yield component traits [13]. In order to select high-yield varieties, it is required to determine the role of effective traits on yield value and to understand their relationship path coefficient analysis [14]. The correlation among traits with yield due to the direct effect of one trait or indirect effects of others could be determined by path coefficient analysis. Investigated traits in correlation analysis had different effects on yield. It was identified as the most important factor to improve final yield which could be examined by regression analysis and used to identify the factors leading to highest direct or indirect effect on yield [15,16]. It is to be noted that evaluating direct and indirect effects of traits by using of the path coefficient analysis provides more accurate and acceptable results in this regard. Using Correlation and regression analysis cannot provide accurate selection of suitable indices toward estimating of regression coefficients among agronomic traits, which led to the development of appropriate information in order to improve plants. Identifying and understanding relationship between traits and especially effect of each trait on yield was the first step for selecting best plant breeding components [16]. Determination of components with highest direct effect on conservable grain yield was the most important factor in improving grain yield in managing the breeding program. Planning more successful breeding programs and more desired varieties are attainable, if these relationships are used [17].

2. MATERIALS AND METHODS

2.1 Experimental Details

This study tends to evaluate the effects of planting methods and varieties on morphological traits, yield and yield components of sweet and super sweet corn hybrids, in order to estimate simple correlations including direct and indirect effects on conservable grain yield at the Khorasan Razavi Agricultural and Natural Resources Research center, Mashhad, Iran in 2012.

2.2 Methodology

This experiment was conducted at the Khorasan Razavi Agricultural and Natural Resources Research center (Latitude: 36^{o}13' N., Longitude: 59^{o}40' E., and 985 meters above sea level), Mashhad, Iran in 2012. The present study was conducted to evaluate the effects of planting methods on morphological traits, yield and yield components of sweet and super sweet corn (*Zea mays L. Var Saccharata*) varieties. Three planting method (one row raised bed, two row raised bed and furrow planting), sweet corn varieties (Chase, Temptation, KSC403su and Challenger), was laid out in factorial design based on randomized complete block design with three replication. Seeds were planted on June 20th. Soil texture at experimental area was silt loam (PH=8 and EC=1/67 mmho/cm). In this research each experimental plot consisted of 4 lines with 4/5 meters length, 75 and 20 cm spacing between rows, respectively. The plant density was 66000 plant/ha. Three seeds were planted per hill, which were thinned to one plant per hill at 4-6 leaf stage. Fertilizer was used based on soil test. At sowing 200kg/ha Ammonium phosphate ($NH_4H_2PO_4$), 200kg/ha K_2SO_4, 300kg/ha urea (CH_4N_2O) was used for each experiment and this was followed by 200 kg/ha N as urea at the six leaf stage. During the growth period, researchers considered some of the morphological traits such as plant height, ear height, and ear leave area. Recorded data of 10 competitive plants were obtained from each plot of yield component and conservable grain yield (kg.ha^{-1}) and all were calculated for the entire plot. Also, the relative growth rate (RGR) based on the following formula as suggested and calculated by Nevada and Cross are as follows [18]:

$$RGR = \frac{0.75 \times \text{leaf width} \times \text{leaf lenght} \times \text{number of total leaf}}{number\ of\ date\ silking}$$

At the time of harvesting sweet corn, which was the beginning of soft dough stage, two lateral rows and half a meter were removed in each plot. Then, the rest of plants were counted and weighed; then, grains were harvested by hand. After that, traits including ear diameter, number of ear per plant, grain depth, grain percentage, and cob percentage of 10 ears in each plot were observed and recorded, on a random basis [19].

$$Grain\ Depth_{(\text{mm})} = \frac{\text{dehusked ear diameter} - \text{ear cob diameter}}{2}$$

$$Ear\ Cob\% = \frac{\text{10 ear cob wieght}}{\text{10 dehusked ear}} \times 100$$

In this study, In order to determine conservable grain yield, Kernels were cut from 10 cobs surface in each plot separately and 100gr of kernels as sample dried at 80 centigrade degree for 72hours. Then wet and dry grain yield were calculated based on 70 percent humidity for each experimental unit. Trait of plant harvest index was obtained from the calculation of proportion of grain yield than biological yield. In Statistical analysis, Analysis of variance data was estimated based on randomized complete block design. Then, the correlation coefficients between studied traits were estimated. Although the correlation coefficients between traits presented useful information and separation of simple correlation coefficients in detail and their direct and indirect effects via path analysis provided information were more accurate. in this way, researchers were able to access the proper information and select traits, which were useful for achieving desired goals [9,10]. For this purpose, conservable grain yield was considered as dependant variable and the Stepwise regression analysis was used to identify the traits' effects on conservable grain yield. Then, direct and indirect effects of traits on conservable grain yield were computed via path analysis [20]. In this research, data related to traits measurements, were entered to Excel software and the result information was analyzed by MSTAT-C software. Means were compared using Duncan's multiple range tests at a 0.05 level of probability and F values were significant [21]. In order to compute simple correlation coefficient between all variables, stepwise regression and the Calculation of path coefficient were conducted SAS (ver.9.2) software using.

3. RESULTS AND DISCUSSION

Results of variance analysis for all traits were affected by different planting methods ($P<.01$), although the grain percentage and cob percentage did not have significant differences

(Table 1). The results showed significant differences among varieties for number of ear per plant, grain depth, cob ear percentage, grain percentage (P=.05), 1000-grain weight and conservable grain yield (P<.01) (Table 1). Result of interaction between varieties × planting method indicated were significant differences for number of ear per plant, grain depth, grain percentage, cob percentage, 1000-grain weight and conservable grain yield at a 1% level of probability. It was only significant in plant harvest index at a 5% level of probability (Table1). In this experiment, mean comparison of planting method × varieties indicated the highest amount of 1000-grain weight one row raised bed method belonged to Challenger being about the average of 128gr (Table 2). Also, the highest amount of conservable grain yield two-row raised bed method belonged to Challenger with average of 25ton/ha while the interaction effects of one rows raised bed × verities indicated 43 percent which belonged to Cheas (Table 2).

3.1 Correlation Analysis

Result of Simple correlation coefficients indicated that there were a significant positive correlation between conservable grain yield and traits of grain depth, ear diameter and grain percentage ($r=0.42^{**}$, $r=0.53^{**}$ and $r=0.43^{**}$ respectively). Conservable grain yield and cob percentage ($r=-0.43^{**}$) had significant negative correlation (Table 3). It is noticeable that correlations less than 50 percentages do not have biological value in breeding programs. Investigation of simple correlation coefficients demonstrated the conservable grain yield had significant correlation with traits of 1000-grain weight ($r=0.82^{**}$) and plant harvest index ($r=0.77^{**}$). Results in this experiment concur with results of other researchers[13,22,23]. In this experiment, results of simple correlation coefficients demonstrated the significant positive correlation between relative growth rate and plant height, ear height respectively ($r=0.86^{**}$ and $r=0.93^{**}$). Moreover, the highest negative significant correlation were observed between conservable grain yield and ear leaf area, cob percentage being about ($r=-0.43^{**}$) (Table 3). Results of stepwise regression analysis indicated the above trait as the first one, which was entered to the model. These results were in agreement with those obtained by Pongsak. [24]. The correlation between relative growth rate and traits of ear leaf area, ear diameter had significant effect at a 1% level of probability, amount of 0.63^{**} and 0.95^{**}, respectively.

3.2 Regression Analysis

Considering the conservable grain yield as dependant variable at a 5% level of probability and the results obtained from stepwise regression analysis indicated that conservable grain yield was affected by three traits including the 1000-grain weight, ear diameter and ear number per plant (Table 4). In addition, investigation of the correlation coefficient between conservable grain yield and traits of ear diameter, number of ear per plant showed that these two variables had the highest correlation ($r= 0.82^{**}$) (Table 3). Therefore, at first step, high correlation between these two traits led to the inclusion of the 1000-grain weight in model, which could justify 0.67 percent solely, and the largest share in conservable grain yield (Table 4). Considering the numerical amount of adjusted coefficient, three traits above had the high cumulative effect with more than 74% on conservable grain yield (Table 4). Out of three traits, which were entered to the model, the highest model of regression equation coefficient (2.85) was related to the trait being the number of ears per plant (Table 5). It seemed that the results obtaining from this study were affected by genetic and environmental factors in site testing. Thus, in order to improve the conservable grain yield, these traits were useful.

3.3 Path Coefficient Analysis

Evaluating of path coefficient analysis of each studied trait manifested the trait of the1000-grain weight (0.846), ear diameter (0.248) and number of ear per plant (0.225) had just positive indirect effects on conservable grain yield (Fig. 1). The result of indirect effects indicated that ear diameter had positive indirect effects on conservable grain yield which could be justify via the (0.028) weight of 1000 - grain. Thus, it can be said the number of ear per plant had indirect and negative effects on conservable grain yield via ear diameter (-0.0921) and 1000grain weight (-0.0521) (Table 6).

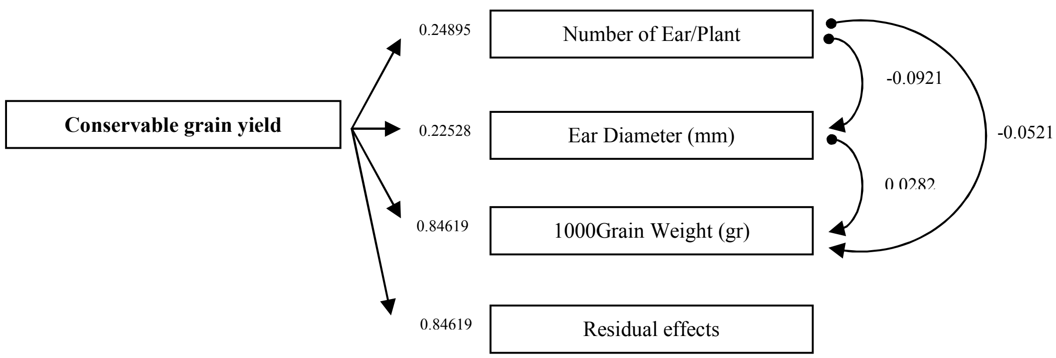

Fig. 1. Path coefficient values estimated for Conservable grain yield of sweet corn

3.4 DISCUSSION

Results of this study show that selection of varieties and suitable planting methods had significant effects on yield and yield components. Other studies reported significant differences in corn varieties on traits such as plant height, ear cob length, flag leave area, number of grain per ear, biological yield and grain yield [14]. Simplicity of recognition or measurement of trait(s), related to the high yield had particular importance in breeding programs in a way that they should be recognizable in farm directly, as they lead to increase in final yield [25]. In practice, the most important trait was grain yield in all breeding programs. In addition to low heritability, it was a complex trait, and affected by a range of morphological and physiological mechanisms. One of the effective traits on yield was ear leaf area. It seemed that increase in this trait led to reduction of conservable grain yield, which was indicated in form of negative correlation (Table 3). Result showed that high correlation between conservable grain yield and ear leaf area corn leaf.

It sounds that role of photosynthesis on leaves in grain fullness per ear and subsequently on grain yield was determinant. Increase in Co_2 absorption, producing photo Assimilate and reduction of entering the photosynthetic active radiation to the lower classes of canopy, increase in plant height and corn as two main resources of reserving assimilate were logical, because of the increase in leaf's growth rate and the leaf corn area. These results were in consistency with the ones obtained by [25,26]. Thus, high significant positive correlation between conservable grain yield and 1000-grain weight confirmed this (Table 3). Logically increase in amount of this trait should be considered in selection of high yield varieties. According to These results, 1000-grain weight can be known as the most important trait, because of most positive direct effect on conservable grain yield.

Table 1. Means Square of Analysis Phonology characters, Yield, and Yield component on sweet and super sweet corn

Source of Variances	Df	1	2	3	4	5	6	7	8	9	10	11	12
Replication	2	53^{ns}	135^{ns}	890^{ns}	13.6^{ns}	0.07^{ns}	0.069^{ns}	0.35^{ns}	0.002^{ns}	0.002^{ns}	20^{ns}	0.49^{ns}	107^{ns}
Pm	2	2103^{**}	2697^{**}	64475^{**}	2263^{**}	12.9^{**}	0.34^{**}	5.6^{**}	0.002^{ns}	0.002^{ns}	109.62^{**}	11.409^{**}	238^{**}
V	3	85^{ns}	137^{ns}	8437^{ns}	216^{ns}	0.2^{ns}	0.33^{*}	2.5^{*}	0.004^{*}	0.004^{*}	1154.83^{**}	77.105^{**}	70.7^{ns}
Pm*V	6	128^{ns}	116^{ns}	7906^{ns}	161^{ns}	4.7^{ns}	1.08^{**}	3.06^{**}	0.003^{**}	0.003^{**}	86.56^{**}	3.352^{**}	136^{*}
Error	22	156	244	5387.5	205	2.1	0.8	0.6	0.001	0.001	10.74	0.8	46
CV	35	31.44	8.99	20.37	34.55	3.11	15.75	4.58	4.63	9.61	2.9	4.55	21

*(1):Ear Height, (2): Total Plant Height, (3): Leaf Area Index, (4): Leaf Ear Growth ratio, (5): Ear Diameter, (6): Number of Ear/Plant, (7): Grain Depth, (8): Grain%, (9): Cob%, (10): 1000Grain Weight, (11): Conservable grain yield and (12): Plant Harvest Index. Pm: Planting Methods, V: Varity and Pm*V: Interaction Between Planting Methods and Varity. Also C.V: Coefficient of variance. Ns,* and **: Non – significant and significant at 5% and 1% levels of probability, respectively*

Table 2. Means Comparison some Morphological Traits, Yield, and Yield component of Sweet and Super sweet Corn

Trait	Levels	1	2	3	4	5	6	7	8	9	10	11	12
Planting Method(M)	M1	29.4a	163b	329.7b	34.29b	46.6b	1.4a	17b	0.64a	0.35a	110b	19b	28.19b
	M2	35.1b	168b	307.2b	32.86b	47.4b	1.19b	18.3a	0.66a	0.33a	116a	19b	37.05a
	M3	54.7b	191a	443.9a	57.33a	48.7a	1.08b	17.4b	0.67a	0.32a	112b	20a	31.6ab
Verities(V)	V1	36.9a	171.8a	327.9a	35.4a	47.7a	1.2ab	18.3a	0.6ab	0.3ab	118b	19b	34.5a
	V2	41.4a	178.5a	401.3a	45.47a	47.3a	1.3a	17b	0.63b	0.36a	101d	17c	28.2a
	V3	37.4a	170.1a	351.2a	39.64a	47.7a	1.1b	17.4b	0.67a	0.32b	126a	23a	32.9a
	V4	43.3a	176.3a	360.7a	45.45a	47.6a	1.1ab	17.5ab	0.68a	0.31b	105c	17c	33.5a
Planting Method× Verities	M1 * V1	26a	158.2a	292a	28.16a	46.2a	1.4b	17.7a-d	0.6ab	0.3bc	107c	20c	22.34e
	M1 * V2	27.1a	167.3a	337.4a	30.72a	47.1a	1.8a	16.7de	0.60c	0.39a	101de	16e	34a-e
	M1 * V3	25.1a	158.9a	334.4a	33.03a	45.7a	1.2bc	15.81e	0.6bc	0.4ab	126a	22b	26cde
	M1 * V4	39.5a	168.7a	354.9a	45.24a	47.5a	1.06c	17.7a-d	0.6ab	0.3bc	105cd	17de	29b-e
	M2 * V1	31.8a	167.2a	264.9a	26.21a	48.1a	1.2bc	18.9ab	0.6bc	0.4ab	127a	18cd	43.58a
	M2 * V2	45.4a	177.9a	429.3a	48.1a	47.9a	1.04c	18.3abc	0.6ab	0.3bc	105cd	16e	27b-e
	M2 * V3	27a	155.8a	245.2a	26.39a	47.5a	1.02c	19.12a	0.69a	0.30c	128a	23b	36.5abc
	M2 * V4	35.7a	171a	289.6a	30.73a	45.9a	1.4b	17cde	0.6ab	0.3bc	103cde	17.1e	40.4ab
	M3 * V1	53a	189.9a	426.9a	51.83a	48.7a	1.0c	18.2a-d	0.69a	0.30c	119b	18cd	37.5acb
	M3 * V2	51.7a	190.3a	437.3a	57.6a	46.9a	1.2bc	15.88e	0.6bc	0.3ab	98e	19c	23de
	M3 * V3	59.4a	195.6a	473.9a	59.5a	49.7a	1.00c	17bcd	0.7a	0.3c	124ab	25a	35a-d
	M3 * V4	54.6a	189.4a	437.6a	60.38a	49.4a	1.04c	18abcd	0.6ab	0.3bc	108c	19c	30a-e

(1):Ear Height (Cm), (2): Total Plant Height (Cm), (3): Leaf Area Index (Cm^2), (4): Leaf Ear Growth ratio, (5): Ear Diameter (Cm), (6): Number of Ear/Plant, (7): Grain Depth(mm), (8): Grain(%), (9): Cob(%), (10): 1000Grain Weight(gr), (11): Conservable grain yield (Ton/Hec) and (12): Plant Harvest Index(%). Planting Method (M1: furrow planting, M2: one raised bed and M3: two raised bed) Varieties (V1: Chase, V2: Temptation, V3: Challenger and V4: Ksc403 su). Means, in each column, followed by similar letter are not significantly different at the 5% probability level using Duncan, s multiple range test

Table 3. Correlation coefficients among Morphological Traits, Yield and Yield component of Sweet and Super sweet Corn

	Ear Height	Total Plant Height	Leaf Area Index	Leaf Ear Growth ratio	Ear Diameter	Number of Ear/Plant	Grain Depth	Grain (%)	Cob (%)	1000Grain Weight	Conservable grain yield	Plant Harvest Index
(1)	1.0											
(2)	0.94^{**}	1.0										
(3)	0.87^{**}	0.8^{**}	1.0									
(4)	0.93^{**}	0.86^{**}	0.95^{**}	1.0								
(5)	0.69^{**}	0.63^{**}	0.54^{**}	0.63^{**}	1.0							
(6)	-0.4^{*}	-0.28^{ns}	-0.28^{ns}	-0.38^{*}	-0.4^{*}	1.0						
(7)	-0.02^{ns}	-0.06^{ns}	-0.26^{ns}	-0.18^{ns}	0.33^{*}	-0.21^{ns}	1.0					
(8)	-0.09^{ns}	0.03^{ns}	0.06^{ns}	0.01^{ns}	-0.21^{ns}	0.34^{*}	-0.57^{**}	1.0				
(9)	0.09^{ns}	0.03^{ns}	-0.06^{ns}	-0.01^{ns}	0.21^{ns}	-0.34^{*}	0.57^{**}	-0.98^{**}	1.0			
(10)	-0.06^{ns}	-0.17^{ns}	-0.21^{ns}	-0.16^{ns}	0.11^{ns}	-0.23^{ns}	0.4^{*}	0.4^{*}	-0.4^{*}	1.0		
(11)	0.02^{ns}	-0.03^{ns}	-0.43^{**}	-0.08^{ns}	0.05^{ns}	-0.07^{ns}	0.42^{**}	0.43^{**}	-0.43^{**}	0.82^{**}	1.0	
(12)	-0.16^{ns}	-0.27^{ns}	-0.27^{ns}	-0.27^{ns}	0.06^{ns}	-0.05^{ns}	0.33^{*}	0.16^{ns}	-0.16^{ns}	0.74^{**}	0.77^{**}	1.0

(1): Ear Height, (2): Total Plant Height, (3): Leaf Area Index, (4): Leaf Ear Growth ratio, (5): Ear Diameter, (6): Number of Ear/Plant, (7): Grain Depth, (8): Grain(%), (9): Cob(%),(10): 1000Grain Weight, (11): Conservable grain yield, (12): Plant Harvest Index. Ns, and **: Non – significant and significant at 5% and 1% levels of probability, respectively*

Table 4. Summary of Stepwise Regression for independent variable

Variable Entered	M.S Model	M.S Error	F -Value	Partial R-Square	adj R-Square	C(p)
1000Grain Weight	334.08	4.70	70.96**	0.6761	0.6761	34.21
Ear Diameter	173.4	4.46	38.84**	0.0258	0.7019	30.94
Number of Ear/Plant	122.27	3.97	30.73**	0.0405	0.7423	24.66

Ns, and **: Non – significant and significant at 5% and 1% levels of probability, respectively*

Table 5. Coefficients of Stepwise Regression equation in conservable grain yield

Variable	Intercept	First Step	Second Step	Thirth Step
1000Grain Weight(gr)	8.8030	0.0864	0.8451	0.0889**
Ear Diameter	-7.7908	-	0.3530	0.5439**
Number of Ear/Plant	-20.8798	-	-	2.8534**

** and **: Regression coefficient in last step was significant at 5% and 1% probability levels respectively, X_1 = 1000Grain Weight, X_2 = Ear Diameter, X_3 = Number of Ear/Plant, $Y= 8.8030 + 0.0864X_1$, $Y= -7.7908 + 0.8451X_1+ 0.3530X_2$, $Y= -20.8798 + 0.0889X_1 + 0.5439X_2 + 2.8534X_3$*

Table 6. Parameter Estimates of Path analysis for conservable grain yield

Variable	DF	Standard Error	T Value	Standardized Estimate	Correlation With Y	Indirect Effect (Y)		
						Ear Diameter	Number of Ear/Plant	1000Grain Weight
Ear Diameter(mm)	1	0.21491	2.53**	0.24895	0.25^{ns}	---	-0.1018	0.0282
Number of Ear/Plant	1	1.27236	2.24*	0.22528	-0.07^{ns}	-0.0921	---	-0.0521
1000Grain Weight(gr)	1	0.00970	9.17**	0.84619	0.82^{**}	0.0958	-0.1958	---

Ns, and **: Non – significant and significant at 5% and 1% levels of probability, respectively*

It can be used as the criteria, which is applicable for choosing varieties of high yield sweet corn. Considering negative direct effects, it can be expressed that selection of those varieties with less number of ear may increase through heightening of the ear diameter. The above-said leads to weights, more than 1000-grain and finally it leads to the increase in conservable grain yield. Considering the formation of all effective traits on yield during the growth period and their effects on each other and finally on grain yield, it is to be noted that providing the suitable conditions for growth and selection of suitable planting methods can be the one way for improving conservable grain yield.

4. CONCLUSION

Considering result of this study, different planting methods have indicated significant effect on morphophisological characteristics of all the studied traits. Study is common results of varieties, significant differences have been observed on traits such as number of ear per plant, grain depth, grain percentage, cob percentage, 1000-grain weight, and conservable grain yield and plant harvest index. In this experiment, Study of correlation coefficients on the studied traits indicates that there is a significant correlation between conservable grain yield and all traits except plant height, ear height, and relative growth rate of ear leaf, ear diameter, and number of ear per plant at a 1% level of probability. Results of stepwise regression analysis indicate that conservable grain yield is affected by the three traits of the 1000-grain weight, ear diameter, and number of ear per plant. Therefore, the three traits above have had high and significant regression coefficient on conservable grain yield, which can totally justify more than 74 percent of the conservable grain yield variation. Effects of other studied traits are relatively insignificant. Considering result of path analysis, direct effects of all traits on conservable grain yield are positive. Consequently, traits such as 1000-grain weight, ear diameter, and number of ear per plant have respectively the highest positive and direct effect on conservable grain yield. Generally, results of the study emphasize that, selecting plants, which have 1000-grains weighed more than others have and have more ear diameter, in proportion to the number of ear per plant, are appropriate for improving the conservable grain yield. Therefore, in order to achieve more desired results leading to prediction of future condition confidently, such an experiment should be extended in scope to cover other possible aspects.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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