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EVALUATION OF TEN MAIZE HYBRIDS FOR SILAGE YIELD AND QUALITY

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ABSTRACT

A field experiment was carried out at Gemmeiza Research station during the two successive seasons; 2005 and 2006 to evaluate ten maize hybrids for silage yield, quality, and nutrient contents. The experiment included three single cross (SC10, SC123, SC155) and seven three-way cross hybrids TWC310, TWC311 TWC320 TWC321, TWC322, TWC323,and TWC324 . Significant differences (P0.05) were found among the tested hybrids; The highest fresh silage yield was recorded for hybrid SC10 in both seasons, (23.94 and 25.31 tons / faddan, respectively). Hybrids TWC320 and TWC324 possessed the highest dry matter (DM) yield in the two seasons (6.65 and 7.51 t fad^{-1}), respectively. It was evident that the number of days to 50% tasseling, combined over the two seasons, ranged between 59 and 66 for SC155 and SC123 hybrids respectively . Respecting to 50% sillking, the combined analysis showed 8.25 days difference between the earliest (SC155) and the lastest hybrid (SC10). Results at silage maturity stage, which was assessed on the DM basis ranged between 283 (SC123) and 340 (TWC324) g Kg^{-1} . Data showed that crude protein % ranged between 5.9% (TWC323) to 8.2% (TWC310), CF between 22.4 (TWC320) to 29.5 (TWC), EE between 1.32 (TWC310) to 2.97 (SC10), NFE between 55.1 (TWC324) to 60.1 (TWC320), Ash between 6.3 (TWC322) to 8.5 (TWC311), DCP between 2.03 (TWC323) to 4.15 (TWC310), and TDN between 62.1 (TWC323) to 63.9 (TWC311). For silage quality, pH ranged from 3.6 (TWC311) to 4.05 (SC155), VFAs from 1.46 (TWC311) to 2.44 (SC155), Lactic acid from 3.78 (SC155) to 5.25 (SC10), and NH_3N % from 4.08 (SC123) to 6.88 (SC155). These data indicate that all hybrids are suitable for silage production.

Keywords: Hybrid Maize Silage quality , Quantity, Nutrient composition

INTRODUCTION

Maize is one of the most important cereal crops in Egypt. About 1.7 million faddan are cultivated annually with maize. Therefore, preserving amounts of whole maize plants as silage help in reducing feed shortage problem (Mahmoud *et al*.1992). Utilization of maize silage has increased rapidly as green forage for dairy cattle. This increase can be attributed to the relatively high-energy yield of maize crop and the facility of using mechanization with which the whole plant can be ensiled to provide highly palatable source of energy and high quality forage (Mohamed *et al*.1999) .

Hybrid selection is a key to improve forage quality for optimum animal output. Historically, there has been significant genetic variabilities among maize hybrids for many forage quality components.

Maize hybrids, traditionally, have been selected for grain yield production assuming that high yield of whole plant silage would be attained. However hybrids selected for high grain yield may not be the highest yielding hybrids for whole plant silage, also this selection strategy ignores differences in the nutritive value of whole plant maize silage related to maize genetics.

For a long time breeders and farmers relied on the assumption that a high yielding grain maize variety would be the most suitable for silage production. Genetic variations in maize forage digestibility have been clearly proved (Allen *et al.* 1990; and Wolf *et al.* 1993). Moreover Differences in Crude fiber (CF), Crude protein (CP), and cell wall digestibility, depend on the plant genotype (Roth *et al.,* 1970).

Until recently, it was generally accepted that a good silage hybrid is that possessing a good grain, based on the assumption that silage nutritive value is dominated by the grain component (Andrews *et al.,* 2000). In the past, most differences in maize silage and its digestibility were considered to be related to maturity, and differences between hybrids were of less importance (Kuehn *et al.,* 1999) . Ghanen *et al*. (2000). Found appreciable differences in fresh and DM yieds of stovers in 5 maize hybrids. Bendary *et al*. (2001) reported significant differences in yield of whole plants, DM produced as silage and relative plant parts among 5 single cross, 4 three-way crosses and one variety of maize. They attributed these differences to several factors including variety, time of planting, plant density. Agricultural management and stage of maturity at time of harvest. *Ma et al.(2006*) reported that rapid dry- dawn rate favors grain production, while gradual decline in whole plant moisture (slower dry- down rate) favors silage varieties. This distinct characteristic refracted in the changes in DM accumulation. Therefore, the objectives of this study were:

1-Evaluation of maize hybrids for whole plant silage yield and quality, to determine the best hybrids for silage made from the whole maize plant.

2-Determination of the variation in chemical composition, quality, and nutritive value.

MATERIALS AND METHODS

A field experiment was conducted at Gemmiza. Res. Stn., Egypt in 2005 and 2006 seasons to evaluate ten maize hybrids for fresh and dry silage yields and quality. The evaluated materials involved three single crosses (SC 10, SC 123, SC 155, and seven three – way crosses (TWC 310, TWC 311, TWC 320, TWC 321, TWC 322, TWC 323, and TWC 324) were used . Soil samples were taken before planting at (0 – 30cm) depth and were analyzed for Physical and chemical analysis.(Table 1).

The randomized complete block design with four replications was used. Planting carried out on May, 19th in 2005, and May, 2nd in 2006. Preceding crop was wheat in both seasons. The experimental plot consisted of four rows 6 m in length, 70 cm in width and hills spaced at 30 cm within the row, giving a plant density of 21000 plants/ fad. All cultural practices for maize production were applied as recommended. Nitrogen fertilizer(120 kg N/fad) was added at three equal doses; just before the first, second and the third irrigations. Number of days from planting to 50 % tasseling and silking were counted . At harvest, a random sample of ten guarded plants from each plot was used to estimate plant height (cm) and ear height (cm). The first and fourth row in each plot were considered guarded rows, whereas all plants of the 2nd and 3rd rows were cut at soil surface and weighed at 100 days from planting.

Plants were chopped for making silage. Samples of 0.5 kg were taken from each hybrid to estimate dry matter (DM). Other samples were ensilaged in plastic bags (under anaerobic conditions) for 35 days. After that silage samples of the second season only were subjected to analysis at the forage lab, Giza Res Stn. to determine crude protein (CP), crude fiber (CF),ether extract (EE) and ash, as well as the fermentation characters (pH, Lactic acid ,total volatile fatty acids (TVFAs) and nitrogen ammonia (Nh_3- N % in total N) according to A.O.A.C (1990).

Digestible crude protein (DCP), and total digestible nutrients (TDN) were calculated according to equations of Church (1979) as follows: DCP = CP X 0.929-3.48, TDN = 72.1-(CF X 0.34). Recorded data were statistically analyzed using MSTAT C computer program Ver. (4) (1986) .

Homogeneity of variances was tested for the two seasons using Bartlett's test according to Gomez and Gomez (1984).The test was significant for all traits, except for fresh yield, dry yield, days to 50% silking, and plant height, thus, data of both seasons were combined for only these traits.

Table 1: Physical and chemical properties of the soil at the experimental site.

Physical analysis					
Year	**Coarse Sand %**	**Fine Sand %**	**Silt %**	**Clay %**	**Texture**
2005	2.80	23.21	22.94	52.15	Clay
2006	2.70	22.11	23.19	52.00	Clay
Chemical analysis					
	Available N (ppm)	**Available P (ppm)**	**Available K (ppm)**	**pH**	**EC m. mohs /gm**
2005	130.5	11.6	290.3	8.00	0.93
2006	125.5	12.7	291.5	7.8	1.05

RESULTS AND DISCUSSION

Fresh and dry matter yields

Significant differences were observed among the tested ten hybrids . Fresh silage yield of SC 10 was superior to other hybrids in both seasons (Table 2). TWC 320 had the lowest fresh yield in 2005 season (17.94 t / fad), while SC155 had the lowest fresh yield in 2006 season (19.81 t / fad). On the other hand, TWC 321 had the highest dry matter yield in 2005 season (6.650 t / fad) followed by SC155 and SC10 (6.537 and 6.272 t / fad, respectively). Meanwhile, TWC 324 was superior in 2006 season followed by SC10 and TWC 311 (7.507, 7.300, and 7.145 t / fad, respectively). The two , hybrids TWC 320 and SC 155 were associated with the lowest DM yield in 2005 and 2006, respectively.

Differences in fresh and dry yields among the tested hybrids may be attributed to genetic variability, stages of maturity and harvesting time. These results agreed with those obtained by Ghanen *et al. 2000 and* Bendary *et al.* (2001) Differences in fresh and dry silage yields may have resulted also from the differences of whole plant moisture content at time of harvest *Ma et al. (2006.)*

Table 2: Fresh and dry matter yields (ton/fad), of the ten maize hybrids .

Traits / Hyb.	Fresh silage yield (t/fad)			Dry silage yield (t/fad)		
	2005	2006	Comb	2005	2006	Comb.
SC 10	23.938	25.312	24.635	6.272	7.300	6.786
SC 123	19.063	22.437	20.750	5.240	6.347	5.794
SC 155	20.088	19.812	19.950	6.537	6.065	6.301
TWC310	21.188	20.875	21.030	5.185	6.275	5.730
TWC311	21.625	21.875	21.750	5.432	7.145	6.289
TWC320	17.938	20.625	19.282	4.745	6.582	5.664
TWC321	21.125	22.187	21.656	6.650	6.625	6.638
TWC322	22.050	21.312	21.681	5.822	6.812	6.317
TWC323	22.188	22.875	22.032	5.945	6.535	6.240
TWC324	20.563	22.062	21.313	5.395	7.507	6.451
CV %	9.63	4.36	7.360	10.080	15.92	13.82
LSD 0.05	2.93	1.398	1.584	0.836	1.552	0.861

Days to 50% tasseling and silking , plant and ear heights

Results in Table (3) show that there were significant differences among the ten tested hybrids in number of days to 50% tasseling. Combined analysis over the two seasons ranged from 59.13 for SC 155 to 66.13 days for SC 123. In general, SC 123 and SC 10 were the latest hybrids. Hybrids TWC 310, TWC 311 , TWC 320 , TWC 321, TWC 323, and TWC 324 were intermediate, while SC 155 and TWC 322 were the earliest hybrids. Number of days to 50% silking ranged from 57.25 for SC155 to 63.75 days for SC125 in 2005 and from 62 for SC155 to 73.5 days for SC10 in 2006 . In general SC123 and SC10 were the latest hybrids in 2005 and 2006 respectively, while SC155 was the earliest hybrids over the two seasons. Nofal *et al. (2005).* Reported that 8 maize hybrids differed by 4.3 and 5.3 days for number of days to 50% tassling and by 4.5 and 4.8 days for number of days to 50% silting in the first and second year of their study, respectively*. Ma et al. (2006), also found 7 days difference in number of days to so silking among 4 maize hybrids.*

Plant and ear heights of the different hybrids varied significantly. Plant height ranged from 224 to 264.75 cm in 2005 and from 246.25 to 273.5 cm in 2006. SC 10 was the tallest hybrid followed by TWC 322 then SC 155, which was the shortest hybrid in 2005 season. In contrast, TWC 324 was the tallest hybrid followed by TWC 320, while TWC 311 was the shortest hybrid in 2006 season. Ear height ranged from 126.25 (SC 123) to 157.38 cm (TWC 310) combined over both years. These results are mainly due to differences in the genetical make up of the evaluated hybrids . *Nofal et al. (2005)* found that plant height of 8 maize hybrids differed by 23 and 34cm and ear height differed by 14 and 8 cm in the first and second year, respectively. However Karvchenko *et al.,* (2005) attributed each difference to mostly environmental conditions rather than the genetical make up.

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Chemical composition and feeding value .

Data presented in Table (4) Showed that dry matter (DM) percentage was significantly different among the ten hybrids, ranged between 28.29 % to 34.03 % for SC 123 and TWC 324, respectively. These values are in accordance to those reported by *Ghanem et al 2000* (25.32- 29.88%) and *Bendary et al. 2001* (25.47- 43-69%). Bal *et al* (1997) pointed out that moisture contents were 69.9, 67.6 , 64.9, and 58.0 % for silages from maize harvested at early dent, quarter milk line , two- thirds milk line and black layer stages , respectively. The optimum stage for maize that was ensiled was two-thirds milk line, with some flexibility between quarter and two- thirds milk line. Ma *et al.,* (2006) reported that the ideal silage moisture content of 62 to 70 % was achieved between 40 and 50 days after silking, where these moisture levels were achieved depending on the hybrids and the growing season. Dalal (1989) mentioned differences in DM due to delayed maturity.

Table 4: Percentage of chemical analysis of ten maize hybrids in 2006 season

Traits / Hyb .	DM %	OM %	CP %	CF %	EE %	NFE %	Ash %	DCP %	TDN %
SC 10	28.84	91.8	7.18	24.24	2.97	57.41	8.21	3.19	63.86
SC123	28.29	93.16	6.83	24.64	2.02	59.67	6.84	2.87	63.72
SC155	30.61	92.65	6.72	25.98	2.00	58.05	7.35	2.76	63.30
TWC310	30.06	92.25	8.21	25.81	1.32	56.92	7.75	4.15	63.32
TWC311	32.66	91.56	7.90	25.00	2.08	56.58	8.45	3.86	63.9
TWC320	31.91	92.22	6.96	22.44	2.76	60.07	7.79	2.98	64.48
TWC321	29.86	92.65	6.23	26.82	1.66	57.94	7.35	2.31	62.98
TWC322	31.96	93.67	7.23	26.53	2.46	57.45	6.34	3.24	63.08
TWC323	28.57	92.78	5.93	29.50	2.03	55.32	7.23	2.03	62.07
TWC324	34.03	93.12	7.27	24.47	2.24	55.14	6.88	3.28	63.78
Mean	30.86	92.58	7.04	25.53	2.15	57.85	7.43	3.06	63.45
CV %	8.9	0.7	7.1	2.4	9.6	1.4	8.7	10.9	10.3
LSD 0.05	1.85	NS	0.81	1.37	0.46	1.82	NS	0.76	NS

No significant differences were detected among maize hybrids regarding organic matter (OM) content. On the other hand crude protein (CP) content was significantly different among the tested hybrids, and ranged from 5.93 % (TWC 323) to 8.21 % (TWC 310). Crude protein was declined with increasing maturities, Sheperd and Kung (1996). Crude fiber (CF) content varied between 22.44 to 29.50 % for TWC 320 and TWC 323, respectively. Ether extract (EE) percentage ranged from 1.32 to 2.97% for TWC 310 and SC 10, respectively. Means of nitrogen free extract (NFE) were significantly different among the ten tested hybrids, and ranged from 55.14 to 60.07 for TWC 324 and TWC 320, respectively. Total ash percentage ranged from 6.34 to 8.45 % for TWC 322 and TWC 311, respectively. No significant differences were observed among maize hybrids in terms of ash content. Regarding feeding values, digestible crude protein (DCP %) of the tested hybrids ranged from 2.03% to 4.15% for TWC 323 and TWC 310, respectively. The difference in DCP % may be due to differences in quantity and quality of crude protein in the tested hybrids. Differences among hybrids in total

digestible nutrient percentages (TDN %) were not significant. Means of TDN% ranged from 62.07 to 64.48 for TWC 323 and TWC 320, respectively. Values presented in Table (5) showed significant difference among the tested hybrids in CP, DCP and TDN. TWC 311 was superior in CP, DCP yields, while TWC 324 was the top in TDN yield to the other, recording 564, 276 and 4788 Kg/fad respectively, TWC 323 had the lowest CP and DCP yield recording 388 and 133 Kg / fad while SC 155 had the lowest TDN (3839 Kg /fad) that showed different ranking among hybrids. Although maize is mainly considered a source of carbohydrate, it is also important protein source because of its considerable total protein yield per faddan, which may produce higher yield potential due to the continued high crop growth rate around flowering (Uribelarrea *et al.,* 2004).

Table 5: Crude protein (CP), digestible crude protein (DCP) and total digestible nutrient (kg/fad) (TDN) yield in 2006 season .

Traits / Hyb.	CP kg / fad	DCP kg / fad	TDN kg / fad
HYB	2006	2006	2006
SC 10	524	233	4662
SC123	434	182	4044
SC155	408	167	3839
TWC310	515	260	3973
TWC311	564	276	4544
TWC320	458	196	4244
TWC321	413	153	4172
TWC322	493	220	4297
TWC323	388	133	4056
TWC324	546	246	4788
Mean	474	207	4262
CV %	6.1	11.6	2.8
LSD 0.05	65	54	273

Silage quality

Concerning silage quality, Table (6) indicated that high quality silage with suitable fermentation characteristics yellowish green colour and good smell was observed. The PH values of the ten-tested silage samples ranged from 3.6 to 4.05, which were within the normal range of good quality silage. These results are in agreement with those of *Ghanem et al. (2000)* who reported PH values ranging between 3.49 and 3.93 for five hybrids and *Bendary et al. (2001)* who reported PH values ranging from 3.74 to 4.18 for 10 hybrids and variety. Lactic acid % was higher in SC10 and TWC 324, which might be due to the presence of grains. This agreed with Colenbrander *et al.,* (1971), who stated that whole maize plant contains high content of soluble carbohydrates, which are the main source of lactic acid production. Total VFAs concentrations in all kinds of tested silage ranged from 1.46 to 2.44% of DM, which revealed acceptable silage fermentation. Value of NH_3-N concentration among silage of the different maize hybrids ranged from 4.08 to 6.88. These results indicated good quality silage as stated by Mc Donaled *et al.,* (1995) who reported that the concentration of NH_3-N of good quality silage being usually less than 10% of total N.

Table 6: Means of PH, lactic acid %, VFA % and NH3.N % total N of ten maize hybrids

Traits / Hyb	pH	Lactic Acid% of DM	VFA% mol/100ml	NH3.N% total N
SC 10	3.84	5.28	1.72	4.51
SC123	3.80	4.06	2.08	4.08
SC155	4.05	3.78	2.44	6.88
TWC310	3.71	4.33	1.78	4.70
TWC311	3.60	3.82	1.46	5.17
TWC320	3.72	4.88	1.66	4.51
TWC321	3.62	4.96	1.59	4.78
TWC322	3.68	5.10	1.80	5.22
TWC323	3.68	4.32	1.68	4.81
TWC324	3.76	5.13	1.77	4.40
mean	3.74	4.56	1.8	4.84

In conclusion, since all hybrids did not differs significantly in silage quality, therefore the single cross hybrids 10 and 55 as well as the three way cross hybrids 311, 321, 322, 323 and 324 can be used for silage production based on their superiority in dry silage yield.

REFERENCES

Allen , Ms; K.A.O Neil; D.G . Main and J. Bec (1990) . Relationship among yield and quality traits of corn hybrids for silage J.Dairy Sci 74 (suppl-1) :221- 225.

Andrews C.J; L.M. Dwyer; D.W. Stewart; J.A. Dugas, and P.Bonn (2000). Distribution of carbohydrate during grain fill in leafy and normal maize hybrids . Can . J .Plant Sci (80) 87-95- .

A . O . A . C (1990) : Association of Official Analytical Chemists , Official Methods of Analysis 15th Ed Washington D.C . U. S. A

Bal M.;J.G. Coors. and R. D. Shaver (1997) Impact of the maturity of corn for use as Silage in the diet of dairy cows on intake digestion and milk production J. Dairy Sci.. 80 (10) : 2497-2503 .

Bendary M . M ; C . H . A . Chanem ; E . S . Soliman;, E . A. Amer and F. A. EL Zeer (2001) Nutritional evaluation of ensiling fresh maze stover . Egyption J. Nutrition and feeds (special issue) 4: 105 : 116 .

Church D . C (1979) . Livestock feeds and feeding 4th ed D & B Books , lne Corvallis , Oreges 97330, U . S . A.

Colenbrnder, V.F;L.D. Muller; J. A. Wasson and Cunningham (1971). Effects of added urea and ammonium polyPHosPHate to corn stover silages on animal performance. J. Anim Sci,5: 1091 -1101.

Dalal R.C. (1989) . Long-term effects of no-tillage , crop residue and nitrogen application on properties of a vertisol soil sci. soc Am.J.: 53 1511-1515

Ghanem,G.H.A; E.A.Amer and F.A.Elzeer (2000).Evaluation using maize stover silage by sheep. J Agric. Tanta university, 26 (4): 591-603

Gomez, K.A. and A.A Gomez (1984) .Statistical procedures for agricultural research. John Wiley and Sons .Inc. New York , USA.

Kravchenko A.N;G.P. Robertson. K.D. Thelen and R.R. Harwood (2005) : Management topograPHical and weather effects on spatial variability of crop grain yields. Agron. J.97:514-523 .

Kuehn C .S; J .G Linn; D .G. Johnson; H.G.Jung; and M.I. Endres (1999):Effect of feeding silages from corn hybrids selected for leafiness or grain to lactating dairy cattle .J.Dairy Sci 82: 2746-2755.

Ma B. L; K.D. Subedi, D. W. Stewart and L.M. Dwyer (2006): Dry matter accumulation and silage moisture changes after silking in Leafy and dual –Purpose corn hybrids. Agron J 98: 922-929

Mahmoud ,A..M; M.M. Bendary, M.A Harfoush and G.A. Ramadan (1992) Effect of feeding. Lactating cows corn silage on milk production compared with traditional compared with traditional summer and winter rations . J.Agric . Sci . Mansoura Univ . 17(19):2904

Mc Donald , P;R . A . Edwards; J.F.D Greenhalyh and C.A Morgan (1995) Animal Nutrition 5th Copy right licensing LTD, London .

Mohamed M. M; S . M . M Ahmed and M . M Bendary (1999) . Productive and reproductive performance of growing calves fad rations containing maize silage. Egypt. J. Nutr. feeds 2 (special issue) 445-454 .

MSTAT-C(1986).Amicro computer program for the design, management and analysis of agronomic research experiments. Michigan State Univ. USA

Nofal , F. A. E; G . M . A. Mahgoub , and R . I . I .Faisal (2005) : Nitrogen use efficiency of some maize hybrid under different rates of nitrogen fertilizer . Egypt . J . Appl . Sci . 20 (4) : 145 – 157 .

Roth L.S; G.C. Merten W. A Compton D. D. Stuthmann (1970): Genetic variation for quality traits in maize (*Zea Maize L*) Forage. Crop Sci. 10: 365 -367..

Sheperd,A.C, and L.Kung, Jr (1996) . Effect of an enzyme additive on compositions of corn silage ensiled at various stages of maturity J.. Dairy. .Sci .79:1767-1773

Uribelarrea M ; F. E. Below and S. P. Moose (2004): Grain composition and productivity of maize hybrids derived from the Illinois protein strains in response to variable nitrogen supply. Crop Sci 44: 1593-1600 .

Wolf D.P;J. G. Coors; K.A.Albreeht; D.J. Undersander and P.R.Carter (1993). For extreme Fiber concentrations. crop Sci. 33: 1353 – 1359 .

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أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بالجميزة جمهورية مصر العربية خلال موسمين ٢٠٠٥ – ٢٠٠٦ بهدف تقييم ثلاث هجن فردية (هـ. ف. ١٠ ، هـ. ف. ١٢٣ و هـ. ف. ١٥٥) و سبعة هجن ثلاثية (هـ. ث ٣١٠ ، هـ ث ٣١١ ، هـ ث ٣٢٠ ، هـ ث ٣٢١ ، هـ ث ٣٢٢ ، هـ ث ٣٢٣ و هـ ث ٣٢٤) وذلك لإنتاج السيلاج وجودته . وكان تصميم التجربة قطاعات كاملة العشوائية فى أربع مكررات

وتتلخص النتائج المتحصل عليها فيما يلى :

- هناك اختلاف معنوى بين الهجن محل الدراسة فى كمية الحاصل الطازج وقد تفوق هـ ف ١٠ على باقى الهجن وكانت كمية الحاصل ٢٣,٩٤ ، ٢٥,٣١ طن للفدان خلال الموسمين الأول والثانى على الترتيب.
- تفوق هـ ث ٣٢١ فى حاصل المادة الجافة في الموسم الأول (٦,٦٥٠ طن/فدان) على حين تفوق هـ ث ٣٢٤ لنفس الصفة فى فى الموسم الثاني وأعطى ٧,٥٠٧ طن للفدان على التوالي .
- اظهرت النتائج اختلاف معنوى بين الهجن محل الدراسة فى عدد الأيام من الزراعة وحتى ٥٠ % من ظهور النورة المذكرة وكان الفرق بين الهجن ٧ أيام وكان الهجين هـ ف ١٥٥ أكثر الهجن تبكيراً فى الإزهار حيث وصل لـ ٥٠ % إزهار عندما بلغ عمر النباتات ٥٩,١٣ يوم على حين بلغت هذه الفترة ٦٦ يوماً للهجين الفردى ١٢٣. بلغ الفرق بين الهجن فى عدد الأيام من الزراعة حتى ظهور النورة المؤنثة ٨ أيام وبلغت هذه الفترة ٥٩,٦٢ يوم للهجين الفردى ١٥٥ على حيث بلغت ٦٧,٨٧ يوماً للهجين فردى ١٠.
- تفوق هـ ث ٣١٠ فى نسبة البروتين الخام و البروتين المهضوم وأعطى ٨,٢١ % ، ٤,١٥ % على الترتيب على باقى الهجن وقد أحتوى الهجين الثلاثى ٣٢٠ على أقل نسبة من الألياف الخام ٢٢,٤٤% فى حين أحتوى هـ.ف ١٠ على أعلى نسبة من المستخلص الإيثيرى (٢,٩٧ %).
- أظهرت النتائج تفوق الهجين الثلاثى ٣١١ فى حاصل البروتين الخام و البروتين المهضوم (٥٦٤ و ٢٧٦ كجم/فدان على الترتيب) فى حين تفوق هـ ث ٣٢٤ فى المواد الكلية المهضومة (٤٧٨٨ كجم/فدان)على باقى الهجن.
- بالنسبة لصفات التخمر فى السيلاج كانت فى الحدود الطبيعية فى كل الهجن وقد تراوحت ما بين ٣,٦ - ٤,٠٥ وتركيز حامض اللاكتيك ما بين ٣,٧٨ – ٥,٢٨ % على أساس المادة الجافة وتركيز الأحماض الدهنية الطيارة ما بين ١,٤٦ % الى ٢,٤٤ % وتركيز النتروجين الأمونيومى فى النيتروجين الكلى فى الحدود الطبيعية (اقل من ١٠ %) وتراوحت ما بين ٤,٠٨ – ٦,٨٨ % .
- واظهرت النتائج أن درجة الحموضة (P^H) وتركيز حامض اللاكتيك وتركيز الأحماض الدهنية الطيارة وتركيز أمونيا النتروجين وهى الصفات المعبرة عن جودة السيلاج فى الحدود الطبيعية لجميع الهجن.

والخلاصة أن جميع الهجن كانت متساوية من حيث جودة صفات السيلاج الناتج وبالتالى يمكن استخدام أى من الهجن الفردية ١٠,١٥٥ أو الهجن الثلاثية ٣١١ ، ٣٢١ ، ٣٢٢ ، ٣٢١٣ و ٣٢٤ فى إنتاج السيلاج بناء على تفوقها فى حاصل المادة الجافة.

Table 3: Days to 50% tassling, days to 50% silking, plant height (cm) and ear height (cm) of maize hybrids at Gemmiza in 2005, 2006 and combined over 2005 – 2006 seasons .

Character / Hyb.	50% tassling			50% silking			Plant height (cm)			Ear height (cm)		
	2005	2006	Comb	2005	2006	Comb	2005	2006	Comb	2005	2006	Comb
SC 10	61.500	97.750	64.625	62.250	73.500	67.875	264.750	270.000	267.375	151.00	155.750	153.375
SC 123	63.250	69.000	66.125	63.750	69.000	66.375	237.250	248.500	242.875	120.00	132.500	126.250
SC 155	56.750	61.500	59.125	57.250	62.000	59.625	224.000	247.000	235.500	130.750	144.000	137.375
TWC 310	61.750	64.000	62.875	62.000	64.750	63.375	263.750	266.500	265.125	157.00	157.750	157.375
TWC 311	61.250	63.000	62.125	62.750	63.750	63.250	241.000	246.250	243.625	141.00	152.750	146.875
TWC 320	62.000	64.000	63.000	63.250	65.000	64.125	255.000	273.000	264.000	144.500	159.000	151.750
TWC 321	62.250	63.750	63.000	60.750	65.000	62.875	243.250	266.250	254.750	140.00	146.500	143.250
TWC 322	59.750	62.000	60.875	60.000	63.750	61.875	264.500	272.250	268.375	155.500	153.750	154.625
TWC 323	60.250	64.000	62.125	60.750	64.250	62.500	251.250	268.500	259.875	142.500	151.500	147.00
TWC 324	61.750	63.000	62.375	62.250	65.250	63.750	252.00	273.500	262.750	133.250	159.750	146.500
CV%	2.07	1.53	1.80	2.07	4.79	3.77	2.79	5.13	4.18	4.44	6.80	5.825
LSD 0.05	1.820	1.421	1.128	1.840	4.552	2.400	10.112	19.586	10.769	9.127	14.936	8.551