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Effect of Chemical Ripeners on Juice Quality, Yield and Yield Components of Some Sugarcane Varieties under the Conditions of Sohag Governorate

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Abstract: The present investigation was carried out at Shandaweel Agricultural Research Station, Sohag Governorate during 2009/2010 and 2010/2011 to investigate the effect of chemical ripeners on juice quality, yield and yield components of some sugarcane varieties under conditions of Sohag Governorate. A split plot design with four replications was used where three sugarcane varieties and nine chemical ripeners were randomly distributed in the main and sub plots respectively. The three sugarcane varieties were G.T. 54-9, known as C9 (the commercial variety). G. 84-47 and G. 98-28. The nine chemical ripeners were Ethrel "E1" at 0.6 liter/faddan (one faddan =0.42ha), Ethrel "E2" at 1 liter/ faddan., Fusilade super "F1" at 0.12 liter/ faddan., Fusilade super "F2" at 0.175 liter/ faddan., Glyphosate "G1" at 0.4 liter/faddan, Glyphosate "G2"at 0.7 liter/ faddan., Ethrel plus Fusilade super "E1+F1", Ethrel plus Fusilade super "E2+F2" and control (unsprayed treatment). The results showed that sugarcane G.98-28 variety significant superiority over the other ones in the number of stalk length; diameter and cane yield/ faddan. Meanwhile, sugarcane G. 84-47 variety attained superiority over the two varieties in sucrose, brix, richness, purity, sugar recovery percentages, number of millable cane and sugar yield ton/faddan in both seasons. The results revealed clearly that cane stalk length, diameter, number of millable cane, cane and sugar yields ton/ faddan and quality traits was markedly affected by the used ripeners in both seasons**.** The interaction effect between varieties and chemical ripeners was significant in sucrose, sugar recovery percentages and sugar yield ton/faddan in both seasons. Under conditions of the present work, growing the used sugarcane varieties with used chemical ripeners treatment (Ethrel 1) or (Ethrel 2 + Fusilade 2) getting the highest cane and sugar yields/ faddan.

Key words: Cane and sugar · Growth traits · Quality traits · Sugarcane · Yield

INTRODUCTION

Productivity of sugarcane is depended upon cane yield and its components traits, whereas, sugar yield as a final product greatly affected by cane yield and quality traits at harvest. Commercial sugarcane varieties are inter-specific hybrid and consequently differ in their feature due to the great variation in their genetic make up. In Egypt, many studies were carried out to evaluate genotypes and varieties for productivity and quality traits, where a significant differences among varieties [1-10]. Sugar yields as well as juice quality greatly affected by application of chemical ripeners on some sugarcane varieties. Van Dillewijn [11] defines ripening simply as the "storage of sucrose in the stem" Ripening is best measured by increases in sucrose as percentage dry weight. Sucrose as a percentage fresh weight is not a good measure since apparent ripening can be due to just a desiccation effect. Rostron [12] used Ethrel, Fusilade super and Polado on sugarcane cultivars N: Co.376, N: Co.293, N.11, N.12 and N13. He found that all ripeners improved cane quality and sugar yield by similar amounts in most cultivars. Hadisaputro *et al*. [13] found that glyphosate and fluazifop gave a Brix value of 16.25% and

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15.98%, respectively, compared with 15.46% for the control, meantime, other components of cane quality were also increased. Donaldson [14] demonstrated that effect of ethephon on cane and sucrose yields were not consistent. Fluazifop-butyl appeared to be better than ethephon. Boehm [15] reported that use of sugarcane ripeners (glyphosate and Fusilade [fluazifop]) increased sugar content ton, a specialized adjuvant for sugarcane ripeners, increased sugar value further as compared with ripeners alone. James [16] reported that chemical ripeners such as ethephon, fluazifop, glyphosate, glyphosate-trimesium and showed an increases in juice quality and sugar yield. McDonald *et al*. [17] stated that chemical ripeners are applied to sugarcane to increase sucrose levels at harvest. Solomon *et al*. [18] illustrated that ripening chemicals could elicit positive ripening response with an increase in pol % cane value ranging from 0.2 to 1.0 unit. No adverse effect was noticed on the top feed quality and growth of successive ratoon crop. Morgan [19] found that increases in sucrose (measured by pol) levels in cane juice were observed after combined application of Ethrel + Fusilade (E+F) and after application of glyphosate. Viator *et al*. [20] found that applied glyphosate increased sucrose yield by 300 kg/ha compared with the control. Leite *et al*. [21] noted that ripener application for early harvest sugarcane led to an increase in technological quality, although sugar yield had been significantly affected, which may positively contribute to the profit/ha. Al-Mubarak and Al-Chalabi [22] showed that application 200 mg/l ethephon applied at early sugar cane tellering stage caused significant decreases in the heights but significant increases the number of tillers, stem diameter, the number of milling stems, total stems yield and sugar yield. Application of 100 mg/l glyphosate increased the plant heights but reducing the number of tillers, stem diameter, total stems yield and yield of sugar. Benjamin [23] mentioned that response to glyphosate is based on sugar levels at the time of ripener application; therefore, it is recommended that a hand refractometer could be used to test for Brix as an indicator of the cane's sucrose content prior to application fields with the highest Brix should be treated first and fields with the highest Brix at the recommended treatment-to-harvest interval should be harvested first.

Therefore, this work was conducted to study the effect of chemical ripeners on juice quality, yield and its components of some sugarcane varieties under conditions of Sohag Governorate.

MATERIALS AND METHODS

The present investigation was carried out at Shandaweel Agricultural Research Station, Sohag Governorate, Egypt (26°34N, 31°42E) and 61m above mean sea level) during 2009/2010 and 2010/2011 seasons. The soil of the experimental area was sand clay loam (54.01 sand, 25.34% silt and 20.66% clay) and contained 33.0, 11.4 and 210 ppm available N, P, K, respectively with pH 7.5. Investigated treatments were laid in split plot design where the three sugarcane varieties and nine chemical ripeners were randomly distributed in main and sub plots respectively. The three sugarcane varieties were G.T. 54-9, known as C9 (the commercial variety). G. 84-47 and G. 98-28. The nine chemical ripeners were 1- Ethrel "E1" (480 g/l. ethephon) at 0.6 liter/ faddan. 2- Ethrel "E2" (480 g/l. ethephon) at 1 liter/ faddan. 3- Fusilade super "F1" (212 g/l. fluazifop-p butyl) at 0.12 liter/ faddan. 4- Fusilade super "F2" (212 g/l. fluazifop-p butyl) at 0.175 liter/ faddan. 5- Glyphosate "G1" (360 g/l. glyphosate isopropyl amine) at 0.4 liter/ faddan. 6- Glyphosate "G2"(360 g/l. glyphosate isopropyl amine) at 0.7 liter/ faddan. 7-Ethrel plus Fusilade super "E1+F1" at (0.6 liter Ethrel + 0.12 liter Fusilade super/faddan.). 8-Ethrel plus Fusilade super "E2+F2" at (1 liter Ethrel + 0.175 liter Fusilade super/faddan). 9-Control (unsprayed treatment). In both seasons ripeners treatments was applied at 210 or 240 days from planting. Sugarcane planting was carried out by seed-cutting in 1st week of March and harvested after 12 months in both seasons. Plot area was 42 m^2 with 6 ridges) 7 m long and 1 m apart. Fertilizers were applied at rate 200 kg N/faddan was added as urea (46.5% N) and divided into equal doses in both seasons. The first nitrogen dose was applied after 60 days from planting, while the second dose was applied 30 days later. Phosphorus fertilizer at a rate of 30 kg P_2O_5/ faddan was applied during land preparation as calcium super phosphate (15.5% P_2O_5). Potassium fertilization at rate of 48 Kg K_2O/ faddan as potassium sulphate (48% K_2O) with the second dose of nitrogen fertilizer.

At harvest time (after 12 months from planting date), data were recorded on ten main stalks taken at random from the inter row of each sub plot. The following measurements were taken: Stalk length (cm), stalk diameter (cm), number of millable canes in thousand/ faddan., cane yield (tons/faddan) was estimated from three graded rows and sugar yield (tons/ faddan) was estimated according to the following equation:

Raw sugar production = Cane yield (tons/ faddan) x Sugar recovery % /100

A sample of 20 stalks was collected immediately after harvest per sub plot for quality analysis (sugar parameters). Sugar parameters were determined according to the methods outlined by A.O.A.C. [24]. These parameters were; Brix% in juice determined using "Brix Hydrometer", Sucrose%, Purity%, Richness% was calculated according to the following equation:

Purity% = (Sucrose % / brix %) x 100

Sugar recovery percentage was calculated as follows:

Sugar recovery% = Richness % x Purity %

Where: Richness = (Sucrose in 100g x factor)/100.

Factor = 100 - (Fiber% +Physical impurities +Percent water free from sugar)

Quality parameters were used to estimate sugar % cane which was used in turn to calculate yield of sugar/ faddan. The data were statistically analyzed according to Gomz and Gomez [25] using the computer "MSTAT-C" statistically analysis package by Freed *et al*. [26]. The least significant differences (LSD) test at probability level of 0.05 was manually calculated to compare the differences among treatments means.

RESULTS AND DISCUSSION

Stalk Height and Diameter (cm): Data in Table 1 showed that the evaluated sugarcane varieties differed significantly in stalk length and diameter at harvesting. The promising sugarcane variety G.98-28 surpassed the commercial variety G.T. 54-9 and G. 84-47 with respect to stalk height/cm and diameter. The variance among the tested cane varieties may be due to their gene structure. These findings are in line with those reported by El-Maghraby [7], Bekheet [8], Abd Elatief and Bekheet [9] and El-Geddawy *et al*. [10]. The results in Table 1 cleared that cane stalk length and diameter was markedly affected by the used ripeners in both seasons**.** Plots that did not receive any ripener application (control) had the tallest plants, while E2 + F2 gave highest diameter in both seasons. This result can be due to the role of ripeners, which slow down or inhibit the vegetative growth of plants as mentioned by Al-Mubarak and Al-Chalabi [22]. Furthermore, in both seasons, there were insignificant variances among Ethrel (E2), Glyphosate (G2), E1 + F1 and E2 + F2 ripeners, have been observed with regard to stalk length and diameter. The results manifested that the interaction between sugarcane variety and the applied ripener had insignificant effect on cane stalk length and diameter in both seasons, except diameter in the second season.

Number of Millable Cane (Thousand/ Faddan) and Cane Yield (ton/ faddan): Data presented in Table 2 revealed that number of millable cane significantly responded to the varietal differences. The promising variety G.84-47 surpassed the commercial sugarcane variety G.T. 54-9 and G.98-28 with respect to number of millable cane. These observations were true in the two seasons. This result may be assured that the millable cane number is basically affected by gene- make-up more than the other factors. Data in the Table 2 also indicated that the evaluated sugarcane varieties differed significantly in cane yield/ faddan in the 1st and 2nd seasons. In the 1st one,

Table 1: Stalk length (cm) and stalk diameter (cm) of the tested sugarcane varieties as affected by chemical ripeners and their interactions at harvesting in 2009/2010 and 2010/2011 seasons.

	Stalk length (cm)								Stalk diameter (cm)							
	2009/2010 season				2010/2011 season				2009/2010 season				2010/2011 season			
Chemical ripeners	G.T. 54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean
Ethrel (E1)	319.0	313.0	331.3	321.1	330.7	328.0	343.7	334.1	⌈2.71⌈	⌈2.50⌈	⌈2.95⌈	⌈2.72⌈	2.71	2.50	2.91	2.71
Ethrel (E2)	315.3	310.3	329.0	318.2	328.7	329.0	342.0	333.2	⌈2.71⌈	⌈2.51⌈	⌈2.89⌈	⌈2.70⌈	2.73	2.50	2.94	2.72
Fusilade (F1)	315.7	311.0	329.0	318.6	323.0	328.0	340.7	330.6	⌈2.77⌈	⌈2.53⌈	⌈2.92⌈	⌈2.74⌈	2.75	2.51	2.93	2.73
Fusilade (F2)	313.7	309.3	326.3	316.4	323.7	324.0	337.3	328.3	⌈2.73⌈	⌈2.52⌈	⌈2.95⌈	⌈2.73⌈	2.76	2.51	2.89	2.72
Glyphosate (G1)	318.0	312.7	330.3	320.3	330.0	328.7	342.3	333.7	⌈2.69⌈	⌈2.50⌈	⌈2.95⌈	⌈2.71⌈	2.72	2.50	2.89	2.70
Glyphosate (G2)	313.7	311.3	329.3	318.1	329.7	327.0	343.0	333.2	⌈2.67⌈	⌈2.49⌈	⌈2.89⌈	⌈2.68⌈	2.73	2.51	2.95	2.73
E1+F1	312.7	310.7	327.7	317.0	322.3	327.3	342.0	330.5	⌈2.75⌈	⌈2.51⌈	⌈2.93⌈	⌈2.73⌈	2.76	2.51	2.95	2.74
E2+F2	313.0	308.7	327.0	316.2	323.3	326.0	341.7	330.3	⌈2.77⌈	⌈2.51⌈	⌈2.93⌈	⌈2.74⌈	2.77	2.51	2.96	2.75
Control	323.0	317.3	334.7	325.0	332.0	330.3	347.3	336.5	⌈2.68⌈	⌈2.46⌈	⌈2.87⌈	⌈2.67⌈	2.71	2.47	2.89	2.69
Mean	316.0	311.6	329.4	319.0	327.0	327.6	342.2	332.3	⌈2.72⌈	⌈2.50⌈	⌈2.92⌈	⌈2.71⌈	2.74	2.50	2.92	2.72
LSD at 0.05 level																
Varieties (A)	--	--	--	1.81	--	--	--	2.09	--	--	--	0.04	--	--	--	0.03
Ripeners (B)	--	--	--	1.67	--	--	--	2.25	--	--	--	0.03	--	--	--	0.02
(A) X (B)	--	--	--	NS	--	--	--	NS	--	--	--	NS	--	--	--	0.03

Table 2: Number of millable cane (thousand/fed) and cane yield ton/fed of the tested sugarcane varieties as affected by chemical ripeners and their interactions at harvesting in 2009/2010 and 2010/2011 seasons

	Number of millable cane (thousand/fed)								Cane yield ton/fed							
	2009/2010 season				2010/2011 season				2009/2010 season				2010/2011 Season			
Chemical ripeners	G.T 54-9	G. 84-47	G. 98-28	Mean	G.T .54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G.T .54-9	G. 84-47	G . 98-28	Mean
Ethrel (E1)	43.85	44.24	42.13	43.32	43.24	44.07	41.91	43.08	52.35	50.09	55.71	52.71	51.59	49.47	54.79	51.95
Ethrel (E2)	43.36	44.05	42.11	43.17	43.08	43.86	41.93	42.96	51.66	49.79	54.94	52.13	50.97	48.81	54.19	51.32
Fusilade (F1)	43.59	44.11	42.25	43.32	43.21	44.07	42.01	43.10	52.20	50.10	55.32	52.54	51.38	49.37	54.48	51.74
Fusilade (F2)	43.49	44.04	42.30	43.28	43.15	43.85	41.96	42.99	51.67	49.57	54.85	52.03	50.77	48.64	53.89	51.08
Glyphosate (G1)	43.47	44.15	42.12	43.25	43.14	43.96	42.04	43.05	52.25	50.23	55.46	52.65	51.18	49.44	54.32	51.65
Glyphosate (G2)	43.43	44.12	42.26	43.27	43.17	43.86	41.85	42.96	51.71	49.46	54.77	51.98	50.68	48.70	53.74	51.09
E1+F1	43.48	44.10	42.18	43.25	43.18	43.92	42.07	43.06	52.04	49.94	54.94	52.35	50.95	49.09	54.14	51.40
E2+F2	43.09	44.01	42.03	43.04	42.55	43.87	41.69	42.70	51.50	49.47	54.53	51.83	50.42	48.39	53.53	50.80
Control	43.69	44.11	42/32	43.37	43.33	44.08	42.08	43.16	52.42	50.20	55.94	52.85	51.75	49.61	54.43	51.93
Mean	43.46	44.10	42.19	--	43.12	43.95	41.95	--	51.98	49.87	55.16	--	51.08	49.08	54.17	--
LSD 0.05																
Varieties (A)	--	--	--	0.11	--	--	--	0.10	--	--	--	0.07	--	--	--	0.12
Ripeners (B)	--	--	--	0.15	--	--	--	0.11	--	--	--	0.21	--	--	--	0.15
(A) X (B)	--	--	--	NS	--	--	--	0.20	--	--	--	NS	--	--	--	NS

Table 3: Sucrose% and brix volume% of the tested sugarcane varieties as affected by chemical ripeners and their interactions at harvesting in 2009/2010 and 2010/2011 seasons.

	Sucrose% (cm)								Brix volume%							
	2009/2010 season				2010/2011 season				2009/2010 season				2010/2011 season			
Chemical ripeners	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean
Ethrel (E1)	19.21	20.75	17.87	19.28	18.38	20.29	17.26	18.64	22.31	23.75	21.09	22.38	21.51	23.28	20.73	21.84
Ethrel (E2)	19.71	21.28	18.09	19.69	18.55	20.39	17.43	18.79	22.84	24.33	21.59	22.92	21.70	23.52	20.95	22.06
Fusilade (F1)	18.97	20.83	17.96	19.25	18.39	20.28	17.32	18.66	22.07	23.77	21.29	22.38	21.52	23.28	20.81	21.87
Fusilade (F2)	19.64	21.29	18.27	19.73	18.59	20.40	17.37	18.78	22.51	24.22	21.63	22.79	21.73	23.59	20.93	22.09
Glyphosate (G1)	18.76	20.45	17.78	19.00	18.39	20.24	17.24	18.63	21.97	23.47	21.15	22.20	21.47	23.23	20.72	21.80
Glyphosate (G2)	19.44	21.02	17.90	19.45	18.45	20.30	17.30	18.68	22.49	23.85	21.53	22.62	21.60	23.32	20.77	21.90
E1+F1	20.01	21.39	18.16	19.85	18.51	20.33	17.40	18.75	23.24	24.19	21.72	23.05	21.63	23.33	20.90	21.95
E2+F2	20.21	21.51	18.35	20.03	18.76	20.58	17.59	18.98	23.61	24.86	22.01	23.49	21.91	23.97	21.01	22.30
Control	18.20	20.03	17.32	18.52	17.67	19.44	16.18	17.76	21.58	22.89	20.39	21.62	20.76	22.56	18.79	20.70
Mean	19.35	20.95	17.97	--	18.41	20.25	17.23	--	22.51	23.93	21.38	--	21.54	23.34	20.62	--
LSD 0.05																
Varieties (A)	--	--	--	0.03	--	--	--	0.07	--	--	--	0.15	--	--	--	0.10
Ripeners (B)	--	--	--	0.14	--	--	--	0.07	--	--	--	0.33	--	--	--	0.10
(A) X (B)	--	--	--	0.32	--	--	--	0.13	--	--	--	NS	--	--	--	0.17

Table 4: Purity% and richness % of the tested sugarcane varieties as affected by chemical ripeners and their interactions at harvesting in 2009/2010 and 2010/2011 seasons.

	Purity%								Richness %							
	2009/2010 season				2010/2011 season				2009/2010 season				2010/2011 season			
Chemical ripeners	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean
Ethrel (E1)	86.11	87.35	84.80	86.09	85.44	87.14	83.29	85.29	14.15	15.02	13.59	14.26	13.58	14.71	12.95	13.75
Ethrel (E2)	86.28	87.48	83.82	85.86	85.49	86.71	83.18	85.13	14.49	15.37	13.53	14.46	13.70	14.77	13.06	13.84
Fusilade (F1)	85.97	87.64	84.35	85.99	85.47	87.09	83.22	85.26	14.06	15.08	13.44	14.19	13.59	14.70	12.98	13.76
Fusilade (F2)	87.37	87.89	83.54	86.27	85.52	86.47	82.96	84.98	14.65	15.38	13.51	14.52	13.72	14.77	13.02	13.84
Glyphosate (G1)	85.41	87.12	84.04	85.52	85.67	87.16	83.24	85.35	13.84	14.82	13.32	13.99	13.59	14.68	12.94	13.74
Glyphosate (G2)	86.41	88.14	83.14	85.90	85.43	87.05	83.27	85.25	14.31	15.21	13.39	14.30	13.63	14.72	12.97	13.77
E1+F1	86.12	88.42	83.62	86.06	85.56	87.14	83.27	85.32	14.73	15.46	13.57	14.57	13.67	14.74	13.04	13.82
E2+F2	85.59	86.55	83.37	85.17	85.61	85.87	83.72	85.07	14.82	15.51	13.70	14.68	13.84	14.89	13.17	13.97
Control	84.35	87.52	84.94	85.60	85.11	86.17	86.13	85.80	13.54	14.54	13.01	13.66	13.09	14.13	12.22	13.15
Mean	85.96	87.57	83.96	--	85.48	86.76	83.59	--	14.27	15.15	13.45	--	13.60	14.68	12.93	--
LSD 0.05																
Varieties (A)	--	--	--	0.68	--	--	--	0.29	--	--	--	0.12	--	--	--	0.05
Ripeners (B)	--	--	--	NS	--	--	--	0.28	--	--	--	0.14	--	--	--	0.05
(A) X (B)	--	--	--	NS	--	--	--	0.48	--	--	--	0.24	--	--	--	NS

Table 5: Sugar recovery% and sugar yield (ton/fed.) of the tested sugarcane varieties as affected by chemical ripeners and their interactions at harvesting in 2009/2010 and 2010/2011 seasons.

	Sugar recovery%								Sugar yield (ton/fed.)							
	2009/2010 season				2010/2011 season				2009/2010 season				2010/2011 season			
Chemical ripeners	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean	G. T.54-9	G. 84-47	G. 98-28	Mean
Ethrel (E1)	12.19	13.12	11.54	12.28	11.60	12.82	10.79	11.74	6.380	6.573	6.425	6.460	5.958	6.296	5.872	6.042
Ethrel (E2)	12.50	13.44	11.34	12.43	11.71	12.81	10.86	11.79	6.460	6.695	6.230	6.461	5.928	6.207	5.848	5.995
Fusilade (F1)	12.08	13.21	11.34	12.21	11.62	12.80	10.81	11.74	6.309	6.620	6.272	6.400	5.927	6.275	5.849	6.017
Fusilade (F2)	12.80	13.52	11.29	12.54	11.73	12.77	10.80	11.77	6.616	6.701	6.191	6.503	5.915	6.168	5.776	5.953
Glyphosate (G1)	11.82	12.91	11.19	11.97	11.64	12.80	10.77	11.74	6.175	6.483	6.209	6.288	5.917	6.281	5.811	6.003
Glyphosate (G2)	12.37	13.41	11.13	12.30	11.64	12.81	10.80	11.75	6.395	6.631	6.096	6.374	5.860	6.194	5.766	5.940
E1+F1	12.68	13.67	11.35	12.57	11.69	12.84	10.86	11.80	6.585	6.826	6.236	6.549	5.917	6.261	5.842	6.007
E2+F2	12.68	13.43	11.43	12.51	11.85	12.79	11.03	11.89	6.533	6.641	6.231	6.469	5.933	6.143	5.870	5.982
Control	11.42	12.73	11.05	11.73	11.14	12.18	10.53	11.28	5.943	6.389	6.181	6.171	5.726	5.999	5.693	5.806
Mean	12.27	13.27	11.29	--	11.63	12.74	10.80	--	6.337	6.618	6.230	--	5.898	6.203	5.814	--
LSD 0.05																
Varieties (A)	--	--	--	0.20	--	--	--	0.06	--	--	--	0.11	--	--	--	0.02
Ripeners (B)	--	--	--	0.23	--	--	--	0.07	--	--	--	0.13	--	--	--	0.04
(A) X (B)	--	--	--	0.40	--	--	--	0.11	--	--	--	0.22	--	--	--	0.07

G.98-28 variety out-yielded G.T.54-9 and G.84-47 in cane yield by 3.18 and 5.29 tons/ faddan, respectively. Similarly, G.98-28 surpassed G.T.54-9 and G.84-47 by 3.09 and 5.09 tons/ faddan, respectively in the 2nd season. These results are probably due to the same tendency observed a stalk length and diameter (Table 1). The difference between the tested cane varieties in cane yield can be attributed to their gene make-up. This result is in line with that reported by Bekheet [8], Abd Elatief and Bekheet [9] and El-Geddawy *et al*. [10]. The results in Table 2 disclosed that number of millable cane and cane yield per faddan were significantly affected by the applied ripeners in both growing seasons. The results indicated that the check treatment (no ripener application) produced the highest number of millable cane and cane yield in both seasons. Indeed, cane yield is the final out-put of plant growth during the whole season which affected by all effective nutrition and/or physiological factors affecting its yield potential. In this respect, ripeners play a distinct role in inhibiting the vegetative growth of plants. In addition, the maximum cane yield of the control can be probably due to the highest values of cane stalk length (Table 1) and number of millable canes/faddan (Tables 2). Plots that were not applied with any of the studied ripeners produced 1.02 and 1.13 ton of canes/faddan higher than that sprayed with E2 + F2, which recorded the lowest cane yield/faddan, in the 1st and 2nd seasons, respectively. Moreover, insignificant variance in cane yield/ faddan was detected between the check treatment and Ethrel (E1) in both seasons. Nevertheless, there was insignificant trend have been recorded with Glyphosate (G2) and (E2 + F2) in the 1st season and with Ethrel (E2) and (E1 + F1), in the 2nd season. The results cleared that cane yield/faddan was insignificantly affected by the interaction between sugarcane variety and the used ripener in the 1st and 2nd seasons. While, number of millable canes/faddan was significantly in the second season only.

Juice Quality Traits and Sugar Yield (Ton/ Faddan): Presented data in Tables 3, 4 and 5 showed that the evaluated sugarcane varieties differed significantly in their quality traits i.e. sucrose, brix, purity, Richness, sugar recovery percentages and sugar yield ton/ faddan in both seasons. The promising sugarcane variety G.84-47 surpassed the other two varieties (G.T. 54-9 and G.98-28) with respect all quality traits and sugar yield ton/ faddan in both seasons. This result may be indicating that quality traits are mainly affected by gene make-up. These findings are in line with those reported by Ismail *et al*. [5], Khalil [6], Bekheet [8], Abd Elatief and Bekheet [9]. Regarding the chemical ripeners results in the same above-mentioned Tables obviously revealed that chemical ripeners significantly affected all quality traits and sugar yield (ton/ faddan.) as well as in the two studied seasons. Treatment (Ethrel 2 + Fusilade 2) gave the highest values for sucrose, brix, Richness and sugar recovery percentages in both seasons. Meanwhile, the treatment (Ethrel 1 + Fusilade 1) produced the higher value in sugar yield (ton/ faddan.) in both seasons. These results are in harmony with those found by Morgan [19], Viator *et al*. [20], Leite *et al.* [21], Al-Mubarak and Al-Chalabi [22] and Benjamin [23]. Concerning the effect of interaction between the two studied factors, data in Tables 3, 4 and 5 indicated that sucrose; sugar recovery percentages and sugar yield ton/faddan were significantly affected in both seasons. However, brix and purity percentages significantly affected in the second season. It is worth

mentioning that the promising sugarcane variety G.84-47 sprayed with chemical ripeners (Ethrel 1 + Fusilade 1) attained the highest values of most quality traits and sugar yield.

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