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Enhancement of Yield and Quality of Sugarcane by Applied Nitrogen, Phosphorus and Filter Cake

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THE PRESENT investigation was carried out at Shandaweel Agricultural Research Station, Sohag Governorate (latitude of 26°33'N, longitude of 31°41'E and Altitude of 69m), in the two successive seasons 2016/2017 and 2017/2018 to investigate the effect of study the effect of nitrogen, phosphorus and filter cake on yield and quality of sugarcane. The filed experimental work was carried out in a Randomized Complete Blocks Design (RCBD) using a split-split plot arrangement in three replications in both growing seasons.

The results showed that increasing nitrogen levels from 150 up to 210kg N/fad resulted in a significant increase in plant length, diameter, stalk weight, number of millable canes, cane and sugar yields, as well as brix, sucrose, quality and sugar recovery percentages in both seasons.

Super phosphate addition by rates 30kg P_2O_5/fad resulted in a significant increase in plant length, diameter, number of millable canes, stalk weight and cane and sugar yields, as well as brix, sucrose and sugar recovery percentages in both seasons.

Results showed that the addition of filter cake by 4tons/fad give a significant increase in plant length, diameter, number of millable canes, stalk weight, cane and sugar yields, as well as brix, sucrose and sugar recovery percentages in both seasons.

Keywords: Sugarcane, Filter cake, Phosphorus, Nitrogen, Cane yield.

Introduction

Sugarcane (*Saccharum* spp. L.) is considered the main crop for sugar industry in the world. Sugarcane is the main source for sugar production in Egypt. Cane and sugar yields as well as juice quality greatly affected by nitrogen and phosphor fertilization levels and applied of organic fertilizer. Concerning sugarcane fertilization with nutritional elements required for plant growth, it's known that nitrogen has a close relationship with yield and its components, where it plays a direct role on growth behavior and juice quality of sugar cane. Nitrogen unites with carbonic compounds to produce a many different organic compounds like chlorophyll, protoplasm, proteins, nucleic acids, vitamins and enzymes. Nitrogen is responsible for growth and development of all living tissues of cane plants. Regarding nitrogen fertilization effect, Nassar et al. (2005) pointed out that increasing nitrogen levels up to 240kg N/fad decreased sucrose, however application of 240kg N/fad increased stalk length and diameter, number of millable cane and cane yield. Ahmed & El-Shafai (2007) found that increasing inorganic-N levels from 120 up to 240kg N/fad resulted in a significant increase millable cane height, millable cane diameter, millable cane/m^2, cane and sugar yields in the plant cane and 1st ratoon crops. Applying 180kg N/fad gave the highest sucrose%. Mokadem et al. (2008) reveled that increasing N levels attained a positive and significant effects on stalk height, millable canes/fad, cane yield/fad, sugar yield/fed and sugar recovery%. El-Geddawy et al. (2012) found that increasing N levels from 170 to 230kg N/fad produced stalk height, stalk diameter, stalk fresh weight, millable canes/fad, cane and sugar yields, as well as brix %, sucrose % and sugar recovery %.

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Neana & Abd El-Hak (2014) concluded that length and stalk diameter, cane and sugar yields and sucrose % significantly increased by increasing N levels from 140 up to 200kg N/fad in both seasons. Abd El-Aal et al. (2015) reported that increasing N fertilization level from 180 to 210 and 240kg N/fad resulted in a significant increase in millable diameter and cane yield of plant cane. On the contrary, sucrose and sugar recovery percentage significantly decreased as the applied N-dose was increased. Bekheet & Abd El-Aziz (2016) found that raising N fertilization level from 180 to 220kg N/fad resulted in a significant increase in cane stalk height, millable diameter, number of millable canes, cane and sugar yields/fad in both seasons.

Phosphorus is necessary for the synthesis of phosphorylated compounds and a lack of this nutrient immediately disturbs plant metabolism and development (Santos et al., 2010). El-Soghier et al. (2003) used four levels of phosphorus fertilization (0, 30, 60 and 90kg P_2O_5/fad) on sugarcane. They found that increasing phosphorus fertilization level up to 90kg P_2O_5/fad increased stalk length, number of millable cane/fad, cane and sugar yields (tons/fad). A bout juice quality the results showed that increasing phosphorus fertilizer level up to 30kg P_2O_5/fad increased brix, sucrose and purity percentages. Osman et al. (2004) showed that phosphorus fertilization 200kg as calcium superphosphate (15.5% P_2O_5/fad) increased stalk length, number of millable cane (thousand/fad), cane and sugar yield (tons/fad). El-Sayed et al. (2005) studied the effect of three levels of phosphorus fertilizer (30, 45 and 60kg P_2O_5/fad). They found that increasing phosphorus fertilization levels up to 60kg P_2O_5/fad significantly increased number of plants/m^2, stalk height, millable diameter and sugar recovery%. Elamin et al. (2007) showed that phosphorus by rates 0, 64.5 and 129kg P_2O_5/ha significantly affected the sugar content % and juice purity%. Santos et al. (2014) found that there are significant effects on sugarcane cultivation. The initial tillering, Birx, cane and sugar yields of sugarcane ratoon crops all benefit from the application of filter cake and soluble phosphate at the time of planting. The best combination for the productivity of stalks and sugarcane ratoons was to apply filter cake at a dose between 1.0 and 2.0ton/ha with 100 to 200kg/ha soluble phosphate at planting.

Filter cake residue, composed of a mixture of bagasse and decanting sludge, has high levels of organic matter, phosphorus and calcium. The phosphorus present in the filter cake is organic, and its release, as it happens to the nitrogen, occurs gradually by mineralization and by microorganisms attack in the soil (Santos et al., 2010), respectively over control. Pakkiyappan & Saminathan (1999) suggested that application of press mud at 37.5ton/ha to sugarcane grown on tannery effluent polluted soils of Coimbatore improve the quality of sugarcane. Application of press mud significantly increased brix, sucrose and CCS (Commercial Cane Sugar) percent. Press mud application increased 78.5 percent sugar yield over control. Kalaimani & Giridharan (2001) reported that tiller population and number of millable canes also exhibited the same trend. Yield differences between treatments ranged from 4 to 20ton/ha in press mud soil than non-press mud soil. Kumar & Verma (2002) studied the effects of inorganic fertilizers NPK, singly or in combination with organic fertilizers press mud (PM), on the yield and juice quality of sugarcane. They found that the application of organic fertilizers press mud (PM) with N+P+K gave the highest cane length and diameter, sucrose and commercial cane sugar in the two growing seasons. The application of organic fertilizers with N+P+K gave the highest values of sucrose, commercial cane sugar, cane yield, number of millable canes, single cane weight and sugar yield in the two growing seasons. Babu et al. (2005) found that the application of farmyard manure and press mud resulted in the highest mean cane (145.8ton/ha) and sugar yield (15.08 ton/ha), respectively. Shankaraiah & Murthy (2005) using chemical fertilizers 50%, 75% and 100% of recommended NPK and Enriched filter cake 10ton/ha and 15ton/ha in comparison with raw filter cake 15ton/ha Integrated at recommended fertilization. Resulted that enriched filter cake at 15ton/ha increased cane, sugar yields. And other yield parameters viz height, weight and diameter of millable cane were influenced favorably due to increasing NPK levels of fertility and addition of FC in general. Santos et al. (2010) using filter cake at rats 0, 0.5, 1.0, 2.0 and 4.0tons/ha and phosphorus fertilizer doses 0, 50, 100 and 200kg/ha of P_2O_5. They found that stalk yield and tillering were influenced by the filter cake rates applied to the soil. Abd-El-Kader (2017) obtained that number of millable cane (thousand/fad), single millable cane weight kg, length and stalk diameter, brix, sucrose, sugar recovery and cane and sugar yields was significantly increased by applied filter cake with NPK. Santos et al (2014) found the best combination which is filter cakes

at a dose between 1.0 and 2.0mg ha^{-1} with 100 to 200kg ha^{-1} soluble phosphate applied at planting. This method obtains higher stalk and sugar yields for sugarcane ratoons (Girma Abejehu, 2015). The results of the experiment indicated that the main effect of filter cake and the interaction effect of filter cake by mineral fertilizer were highly significant ($P \leq 0.01$) both for cane and sugar yields; while the main effect of mineral fertilizer was not significant ($P \leq 0.05$). Application of filter cake highly improved nutritional quality.

The aim of this study investigate the effect of nitrogen, phosphorus and filter cake on yield and quality of sugarcane.

Materials And Methods

A field experiment was carried out at Shandaweel Agricultural Research Station (latitude of 26°33'N, longitude of 31°41'E and Altitude of 69 m), Sohag Governorate, in the two successive seasons of 2016/2017 and 2017/2018 to study the effect of nitrogen, phosphorus and filter cake on yield and quality of sugar cane under conditions of Sohag Governorate.

The filed experimental work was carried out in a randomized complete blocks design (RCBD) using a split-split plot arrangement in three replications in both growing seasons. The levels of nitrogen 150, 180 and 210kg N/fad were allocated in the main plots, the levels of phosphorus15 and 30kg P_2O_5/ fad distributed in the sub plots, while, filter cake 0, 2 and 4ton/fad were distributed randomly in the sub-sub plots. The experimental unit area was $35m^2$ 1/120 fad including 5 rows of 1m and 7m in length.

Sugarcane Geza 2003-47 was planted during the last week of February and harvested after 12 months in both seasons, using the dry method of planting with 3-buded pieces of cane cuttings, were drilled in each furrow. Nitrogen fertilizer applied in the form urea 46% was divided into equal doses, which were applied after 60 days from planting and 30 days later. Phosphorus fertilizer as calcium super phosphate 15.5% P_2O_5 and filter cake was applied during land preparation at rate (0, 2 and 4tons/fad, while potassium fertilizer at rate of 48kg K_2O/fad was added with the second dose of nitrogen fertilization. regarding irrigation of cane the amount of water applied approximately $9000m^3$ per season, the plant irrigated every 15 day in the first period, while in the sumer season every 10-12 day after that every 21 days.

Mechanical and chemical properties of the experimental soil are presented in Table 1, chemical composition of filter cake used in the experiments is presented in Table 2 and Meteorological data are presented in the Table 3.

TABLE 1. Mechanical and chemical properties of the upper 40cm of the experimental soil sites.

Season		2016/2017	2017/2018
Mechanical	Sand%	56.34	51.57
	Silt	28.44	26.30
	Clay	15.22	22.13
Soil texture		Sandy loam	Sandy loam
Chemical analysis	N Available(ppm)	0.20	0.17
	CaCo3%	1.20	1.34
	$Co_{3\ Meq/100g}$	0	0
	$H\ Co_{3\ Meq/100g}$	0.30	0. 26
	$Cl^-_{Meq/100g}$	0.89	0.79
	$So_4^{=}{}_{Meq/100g}$	1.02	1.02
	$Ca^{++}_{Meq/100g}$	0.53	0.50
	$Mg^{++}_{Meq/100g}$	0.27	0.23
	$Na^{+}_{Meq/100g}$	1.25	1.19
	$K^{+}_{Meq/100g}$	0.16	0.15
	EC(ds/m) (1:5)	0.24	0.23
	pH	7.5	7.6

TABLE 2. Chemical composition of filter cake used in the experiments.

Season		2016/2017	2017/2018
Macro elements (%)	Total –N (%)	2.87%	3.0%
	Total – P (%)	1.40%	1.49%
	Total – K (%)	0.70%	0.75%
Micro elements (mg/kg)	Fe	33	34
	Mn	285	305
	Zn	108	113
	Cu	123	135
Organic matter %		30.50	31.60
Organic – C %		18.60	23.33
pH (1:5) Susp		7.44	7.61
EC (dsm-1) (1:5)		1.025	1.050
C/N Ratio		9:3	13:7
Humidity%		52%	50.8%

TABLE 3. Meteorological data recorded at Shandaweel Agricultural Research Station (2016/2017 and 2017/2018 seasons) **

Month	Average Tem. °C		Average RH%		Average wind speed (m/sec)
	T. max.	T. min.	Max. RH%	Min. RH%	
February 2015	26.8	7.5	80.6	18.8	16
March	31.5	13.7	67.1	17.8	19
April	33.8	15.3	55.2	19.7	19
May	39.1	21.4	50.8	20.7	17
June	39.7	22.2	63.2	25.7	13
July	41.1	21.2	83.2	21.0	8.2
August	41.8	23.2	82.1	24.4	8.4
September	41.4	20.8	90.1	24.7	14.6
October	36.7	19.0	84.5	24.9	16.3
November	30.6	11.2	90.2	18.7	16.1
December	23.9	5.2	93.2	21.2	15.6
January 2016	20.5	2.4	83.3	18.4	7.9
February	27.8	8.1	68.2	15.1	12
March	31.3	15.2	55.6	18.9	11.5
April	37.2	17.5	48.0	13.8	10.9
May	38.1	20.2	43.0	16.6	10.7
June	41.3	22.8	45.3	19.2	12.4
July	40.0	21.9	60.7	17.4	12.8
August	38.2	20.2	62.8	16.8	14.4
September	368	17.4	62.7	16.2	15.8
October	34.4	14.7	66.8	15.5	9.8
November	29.0	9.9	69.5	15.4	11.8
December	23.4	4.9	71.6	15.9	14.4
January 2017	22.2	4.7	62.3	15.5	9.5
February	24.0	6.2	56.9	14.1	11.5
March	28.7	11.5	50.3	15.2	12.6

The recorded data

The following data were recorded at harvest:

1. Millable length (cm).

2. Millable diameter (cm).

3. Mmillable weight (kg).

4. Number of millable canes in (thousand/fad) was counted in one square meter base then converted into a number per feddan (4200m^2).

Juice quality

At harvest, a sample of 20 millable canes from each treatment was taken at random, cleaned and crushed through milland was analyzed to determination of the following traits:

1. Brix% was determined in the laboratory using "Brix Hydrometer" according to the method described by "The Chemical Control Lab" of Sugar and Integrated Industries Company (Anonymous, 2006).

2. Sucrose% was determined using "Sacharemeter" according to A.O.A.C. (1995).

3. Juice purity% was calculated using the following equation:

Purity%= (Sucrose% x100)/brix%

4. Sugar recovery percentage was calculated as follows:

Sugar recovery%= Richness% x purity%/100

Yields

1. Cane yield/fad (tons) it was determined from the weight of the three middle rows of each plot (kg) converted into ton/fad.

2. Sugar yield/fad (tons) was estimated according to the following equation:

Row sugar production= Cane yield (tons/fad) x sugar recovery%.

Statistical analysis

The data were statistically analyzed according to Gomez & Gomez (1984), using the computer "MSTAT-C" statistical analysis package by Freed et al. (1989). The least significant differences (LSD) treatment at probability level at 0.05 was manually calculated to compare the differences among means.

Results and Discussion

Millable length and diameter

Data in Table 4 showed that increasing nitrogen fertilization levels from 180 to 210 a significant increase in millable length amounted to 7.22 and 22.00cm in the 1st season, corresponding to 12.16 and 26.05 m in the 2nd one, respectively as compared with that recorded when fertilization was given at 150kg N/fad. Likewise, an increase of 0.03 and 0.05cm in millable diameter was recorded in the 1st season, corresponding to 0.02 and 0.05cm in the 2nd one. These results fairly proved that the supplying sugarcanes with 210kg nitrogen was physiologically needed for better growth and efficient performance of plants to attain their highest potential, compared to those given 150 nutrients at the lowest rate. These results are in harmony with those reported by and Nassar et al. (2005), Ahmed & El-Shafai (2007), Mokadem et al. (2008), EL-Gedawwy et al. (2012), Neana & Abd El-Hak (2014), Abd El-Aal et al. (2015) and Bekheet & Abd El-Aziz (2016).

Results given in the same Table 4 showed that increasing levels of phosphorus fertilizers level from 15 to 30kg/fad super phosphate significant increase millable in length and diameter in both seasons, using 30kg P_2O_5/fad gave the highest values of millable length and diameter. This result may be due to the role of phosphorus in meristemic activity of plant tissues. These results are similar with those obtained by El-Sogheir et al. (2003), Osman et al. (2004) and El-Sayed et al. (2005).

The results indicated that increasing level of filter cake supplied to sugarcanes from 2 to 4tons/fad increased stalk height and diameter of sugar cane significantly by 7.50 and 17.72cm and 0.04 and 0.06cm compared without filter cake, respectively, in the 1st season, corresponding to 9.28 and 19.11cm and 0.03 and 0.04cm, in the 2nd season. These results could be referred to the role filter cake in addition of some organic matter and nutrients to the soil used by cane plants as shown in Table 2. This finding is in accordance with those reported by Kumar & Verma (2002), Shankaraiah & Murthy (2005) and Abd-El-Kader (2017).

The interaction between nitrogen levels and phosphorus fertilizers (NxP) was significantly on stalk length in the 1st season only. The longest stalk of cane is 303.89cm was recorded fertilizer by 210kg N/fad with applying 30kg P_2O_5/fad.

TABLE 4. Nitrogen levels, phosphorus, filter cake and their interactions as affected on millable length and diameter (cm) in 2016/2017 and 2017/2018 seasons.

Nitrogen levels (kg N/fad) (N)	Phosphorus levels (kg P_2O_5/fad) (P)	Millable length (cm)								Millable diameter (cm)							
		2016/2017 season				2017/2018 season				2016/2017 season				2017/2018 season			
		Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			
		0	2	4		0	2	4		0	2	4		0	2	4	
150	15	263.33	273.00	284.33	**273.56**	263.00	270.00	285.67	**272.89**	2.60	2.64	2.67	**2.64**	2.61	2.64	2.67	
	30	271.00	275.00	289.67	**278.56**	268.67	276.67	289.33	**278.22**	2.62	2.67	2.70	**2.66**	2.66	2.68	2.69	
Mean		**267.17**	**274.00**	**287.00**	**276.06**	**265.83**	**273.33**	**287.50**	**275.56**	**2.61**	**2.66**	**2.69**	**2.65**	**2.63**	**2.66**	**2.68**	
180	15	271.67	279.00	288.00	**279.56**	276.33	285.00	290.00	**283.78**	2.64	2.64	2.69	**2.66**	2.65	2.67	2.69	
	30	279.67	285.33	296.00	**287.00**	282.67	293.67	298.67	**291.67**	2.67	2.70	2.71	**2.70**	2.67	2.71	2.71	
Mean		**275.67**	**282.17**	**292.00**	**283.28**	**279.50**	**289.33**	**294.33**	**287.72**	**2.65**	**2.67**	**2.70**	**2.68**	**2.66**	**2.69**	**2.70**	
210	15	284.00	292.33	300.33	**292.22**	286.33	298.33	307.67	**297.44**	2.67	2.69	2.72	**2.70**	2.69	2.71	2.72	
	30	294.67	304.67	312.33	**303.89**	296.00	305.00	316.33	**305.78**	2.67	2.72	2.73	**2.71**	2.70	2.73	2.74	
Mean		**289.33**	**298.50**	**306.33**	**298.06**	**291.17**	**301.67**	**312.00**	**301.61**	**2.67**	**2.70**	**2.73**	**2.70**	**2.70**	**2.72**	**2.73**	
PxF	15	**273.00**	**281.44**	**290.89**	**281.78**	**275.22**	**284.44**	**294.44**	**284.70**	**2.63**	**2.66**	**2.70**	**2.66**	**2.65**	**2.67**	**2.69**	
	30	**281.78**	**288.33**	**299.33**	**289.82**	**282.44**	**291.78**	**305.78**	**291.89**	**2.65**	**2.70**	**2.71**	**2.69**	**2.68**	**2.71**	**2.72**	
Mean of filter cake		**277.39**	**284.89**	**295.11**		**278.83**	**288.11**	**297.94**		**2.64**	**2.68**	**2.70**		**2.66**	**2.69**	**2.70**	
LSD at 0.5 level for:																	
Nitrogen levels (N)					**2.19**				**3.93**				**0.01**				
Phosphorus levels (P)					**1.82***				**2.25***				**0.01***				
Filter cake (F)					**2.25**				**1.26**				**0.01**				
(N)x(P)					**3.15**				**NS**				**NS**				
(N)x(F)					**NS**				**2.18**				**0.02**				
(P)x(F)					**3.18**				**1.78**				**0.01**				
(N)x(P)x(F)					**5.50**				**NS**				**0.02**				

The interaction between nitrogen levels and filter cake (NxF) was significant on millable length in the 2nd season only, while millable diameter affected in the 1st season only.

The interaction between PxF had a significant effect on millable length in both seasons and diameter in the first season only, the longest stalk of cane 299.33 and 305.78cm when adding super phosphate at 30kg P_2O_5/fad with the filter cake rate 4tons/fad in both seasons, respectively.

The 2nd order interactions among the three studied factors had a significant effect on millable length and diameter in the 1st season only. Fertilization sugar cane by rate 210kg N/fad with added 30kg P_2O_5/fad and 4tons filter cake, give the highest millable length and diameter which were (312.33 and 2.73cm) in the 1st season.

Millable weight and number of millable cane

Results in Table 5 showed that increasing nitrogen fertilization levels from 180 to 210 a significant increase in stalk weight kg/plant and number of millable cane/fad (thousand/fad) amounted to (0.036 and 0.069kg/plant) and (0.482 0.913thousand/fad) in the 1st season, corresponding to (0.033 and 0.083kg/plant) and (0.544 and 0.879thousand/fad) in the 2nd one, respectively as compared with that recorded when fertilization was given at 150kg N/fad. This result may be due to the role of N in promotes tillering and canopy development and stalk formation. this results is in a good line with that reported Nassar et al. (2005), Ahmed & El-Shafai (2007), Mokadem et al. (2008), El-Gedawwy et al. (2012) and Bekheet & Abd El-Aziz (2016).

Results in the same Table obtained that the addition of phosphorus was given at a rate of 30kg P_2O_5/fad gave the highest stalk weight kg/plant and number of millable cane/fad in both seasons. This result may be due to the vital role of phosphorus for plant metabolism and photosynthesis as well as promote tillering, canopy and stalk development all of this properties will reflected in all above mentioned. These results are similar with those obtained by El-Sogheir et al. (2003), Osman et al. (2004), El-Sayed et al. (2005) and Abd-El-Kader (2017).

The results obtained that increasing level of filter cake supplied to sugarcanes from 2 to 4tons/fad increased stalk weight kg/plant and number of millable cane/fad by (0.025 and 0.047kg/plant) and (0.758 and 1.298thousand/fad) compared to that recorded by canes left without filter cake, respectively, in the 1st season, corresponding to (0.022 and 0.043kg/plant) and (0.663 and 1.243thousand/fad) in the 2nd season. These results could be referred to that the filter cake added some organic matter and nutrients to the soil used by cane plants (as shown in Table 2). These findings in agreement with those obtained by Kalaimani & Giridharan (2001), Kumar & Verma (2002), Shankaraiah & Murthy (2005) and Abd- El-Kader (2017).

The interaction between NxP had a significant influence on stalk weight in the 2nd season only while, number of millable cane/fad was affected in the 1st season only. The highest stalk weight 1.388kg/plant and number of millable cane/fad 43.376thousand/fad resulted from by fertilizer 210kg N/fad with added 30kg P_2O_5/fad.

The interaction between nitrogen levels and filter cake (NxF) was significant on stalk weight kg/plant in both seasons, while number of millable cane affected in the second season only.

The interaction between PxF had a significant effect on stalk weight kg/plant in both seasons, the highest stalk weight kg/plant 1.326 and 1.317kg/plant when adding super phosphate at 30kgP_2O_5/fad with the filter cake rate 4tons/fad in both seasons, respectively. Number of millable cane/fad was significantly affected by interaction between PxF in the 1st season only, the highest number of millable cane/fad was recorded by appling 30kg P_2O_5/fad and 4ton filter cake/fad.

The 2nd order interaction among the three studied factors had a significant influence on millable weight kg/plant in both seasons. Fertilization sugar cane by 210kg N/fad with added 30kg P_2O_5/fad and 4tons filter cake, give the highest stalk weight kg/plant which were (1.352 and 1.360kg/plant) in the both seasons, respectively.

Juice quality

Data in Tables 6 and 7 show that nitrogen levels a significant effect on brix, sucrose purity

and sugar recovery percentages, in both seasons except purity % in the seconed season only. Gradual increases in brix, sucrose and sugar recovery percentages values were noticed as nitrogen rate increased from 150 up to 210kg N/fad, while increasing nitrogen fertilization from 150 up to 210kg N/fad decrease purity percentage. Similar results were observed by Nassar et al. (2005), Mokadem et al. (2008), El-Geddawy et al. (2012) and Neana & Abd El-Hak (2014).

The results in the same Tables showed that increasing rates of phosphorus from 15 to 30kg P_2O_5/fad caused a significant increase in the brix, sucrose and sugar recovery percentages, as well as purity % was significant in the first season only increasing P fertilizing sugarcane wit levels from 15 to 30kg/P/fad decrease purity percentage. These results are in agreement with those mentioned by by El-Sogheir et al. (2003), Osman et al. (2004), El-Sayed et al. (2005) and Abd-El-Kader (2017).

The results obtained that increasing level of filter cake supplied to sugarcanes to 2 up to 4 tons/fad increased brix, sucrose and sugar recovery percentages significantly by (0.58 and 0.94%), (0.49 and 0.80%) and (0.34 and 0.55%) compared to that recorded by canes left without filter cake, respectively, in the 1st season, corresponding to (0.49 and 0.82), (0.37 and 0.70%) and (0.22 and 0.48%) in the 2nd season while purity % was not significant in both season. Filter cake is a good source of organic matter, NPK and important micronutrients (as shown in Table 2). As well as, improving fertility, productivity and other physical properties of agricultural soils this will reflected on the previous characters. These results are in line with those reported by Pakkiyappan & Saminathan (1999), Kumar & Verma (2002) and Abd- El-Kader (2017).

Brix percentage was significantly affected by the interaction between nitrogen level and phosphorus fertilization level in both seasons. while, purity was significant in the first season only

Brix and sucrose % were significantly affected by the interaction between nitrogen fertilization level and filter cake in both seasons, while, purity and sugar recovery percentages was significantly in the 1st season only.

Brix and sucrose percentages were significantly affected by the interaction between phosphorus level and filter cake in both seasons, while, purity and sugar recovery percentages was significantly in the 1st season only.

The 2nd order interaction among the studied factors had a significant influence on brix , purity and sucrose percentages in both seasons, while, sugar recovery percentages was significantly in the 1st season only.

Cane and sugar yields

Data exhibited a significant variance among the tested nitrogen fertilization levels on cane and sugar yields ton/fad in both seasons (Table 8). The results showed that cane and sugar yields ton/fad of sugar cane was increased significantly by raising nitrogen fertilization level increasing to 180 and to 210kg N/fad, which were (2.182 and 4.122ton/fad) and 0.276 and 0.692ton/fad) in the 1st season, corresponding to (2.099 and 4.679ton/fad) and (0.399 and 0.837ton/fad) in the 2nd season, compared to that supplied with 150kg N/fad. These results fairly proved that the supplying sugarcanes with 210kg N/fad nutrients was physiologically needed for better growth and efficient performance of plants to attain their highest potential, compared to those given 150kg N/fad nutrients at the lowest rate. This may be due to the effect of fertilization course reflects to a large extent the role played by the nutrient in the physiological process such as(photosynthesis, transport and accumulation of sucrose) These results are in agreement with those reported by Santos et al. (2014), Girma Abejehu (2015), Ahmed & El-Shafai (2007), Mokadem et al. (2008), EL-Gedawwy et al. (2012) Neana & Abd El-Hak (2014) and Bekheet & Abd El-Aziz (2016).

Data in the same table showed that cane and sugar yield were significantly by phosphorus application levels. The results in Table 8 show that application of 30kg P_2O_5/fad at planting produced the highest cane and sugar yields (tons/fad) which were (55.235 and 54.831tons/fad) and 6.187 and 6.136tons/fad) in both seasons, respectively, compared by addition 15kgP_2O_5/fad. These results are in line with those reported by El-Sogheir et al. (2003), Osman et al. (2004), Santos et al. (2010) and Santos et al. (2014).

TABLE 5. Impact of nitrogen levels, phosphorus, filter cake and their interactions on millabe cane (thousand/fed) and stalk weight (kg/stalk) in 2016/2017 and 2017/2018 seasons

Nitrogen levels (kg N/fad) (N)	Phosphorus levels (kg P_2O_5/fad) (P)	Millabe cane (thousand/fad)								Millable weight (kg/stalk)							
		2016/2017 season				2017/2018 season				2016/2017 season				2017/2018 season			
		Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean
		0	2	4		0	2	4		0	2	4		0	2	4	
150	15	41.867	42.352	42.622	**42.084**	41.417	42.240	42.675	**42.111**	1.218	1.255	1.285	**1.253**	1.205	1.237	1.255	**1.232**
	30	41.800	42.538	43.157	**42.498**	41.855	42.560	43.245	**42.553**	1.245	1.265	1.303	**1.271**	1.233	1.247	1.288	**1.256**
Mean		**41.540**	**42.445**	**42.889**	**42.291**	**41.636**	**42.400**	**42.960**	**42.332**	**1.232**	**1.260**	**1.294**	**1.262**	**1.219**	**1.242**	**1.272**	**1.244**
180	15	41.937	42.580	43.150	**42.566**	42.073	42.645	43.192	**42.637**	1.270	1.297	1.308	**1.292**	1.260	1.270	1.282	**1.271**
	30	42.317	43.000	43.657	**42.991**	42.515	43.150	43.683	**43.116**	1.285	1.312	1.322	**1.306**	1.268	1.283	1.302	**1.284**
Mean		**42.127**	**42.790**	**43.403**	**42.773**	**42.294**	**42.897**	**43.438**	**42.876**	**1.277**	**1.304**	**1.315**	**1.298**	**1.264**	**1.277**	**1.292**	**1.277**
210	15	42.385	43.053	43.658	**43.032**	42.427	43.032	43.670	**43.043**	1.303	1.325	1.352	**1.327**	1.297	1.315	1.338	**1.317**
	30	42.707	43.452	43.968	**43.376**	42.740	43.378	44.017	**43.378**	1.317	1.337	1.352	**1.335**	1.305	1.348	1.360	**1.388**
Mean		**42.546**	**43.253**	**43.813**	**43.204**	**42.583**	**43.205**	**43.843**	**43.211**	**1.310**	**1.331**	**1.352**	**1.331**	**1.301**	**1.332**	**1.349**	**1.327**
P x F	15	**41.867**	**42.662**	**43.143**	**42.557**	**41.972**	**42.639**	**43.179**	**42.597**	**1.264**	**1.292**	**1.315**	**1.290**	**1.254**	**1.274**	**1.292**	**1.273**
	30	**42.274**	**42.997**	**43.594**	**42.955**	**42.370**	**43.029**	**43.648**	**43.016**	**1.282**	**1.304**	**1.326**	**1.304**	**1.269**	**1.293**	**1.317**	**1.293**
Mean of filter cake		**42.071**	**42.829**	**43.369**		**42.171**	**42.834**	**43.414**		**1.273**	**1.298**	**1.320**		**1.261**	**1.283**	**1.304**	
LSD at 0.5 level for:																	
Nitrogen levels (N)					**0.062**				**0.084**				**0.004**				**0.005**
Phosphorus levels (P)					**0.071***				**0.047***				**0.003***				**0.001***
Filter cake (F)					**0.104**				**0.041**				**0.003**				**0.003**
(N) x (P)					**0.122**				**NS**				**NS**				**0.001**
(N) x (F)					**NS**				**0.070**				**0.005**				**0.005**
(P) x (F)					**0.147**				**NS**				**0.004**				**0.004**
(N) x (P) x (F)					**NS**				**NS**				**0.006**				**0.007**

TABLE 6. Influence of nitrogen levels, phosphorus, filter cake and their interactions on brix and sucrose percentages in 2016/2017 and 2017/2018 seasons

Nitrogen levels (kg N/fad) (N)	Phosphorus levels (kg P_2O_5/fad) (P)	Brix %								Sucrose%							
		2016/2017 season				2017/2018 season				2016/2017 season				2017/2018 season			
		Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean
		0	2	4		0	2	4		0	2	4		0	2	4	
150	15	18.52	19.25	19.65	**19.14**	18.27	19.38	19.65	**19.10**	15.55	16.03	16.34	**15.97**	15.15	16.04	16.40	**15.86**
	30	19.17	19.65	19.89	**19.57**	19.31	19.65	19.94	**19.63**	15.97	16.41	16.57	**16.32**	15.93	16.34	16.46	**16.24**
Mean		**18.85**	**19.45**	**19.77**	**19.36**	**18.79**	**19.52**	**19.80**	**19.37**	**15.76**	**16.22**	**16.46**	**16.15**	**15.54**	**16.19**	**16.43**	**16.05**
180	15	19.17	19.67	20.05	**19.63**	19.51	19.82	20.18	**19.84**	15.88	16.12	16.73	**16.24**	16.21	16.41	16.80	**16.47**
	30	19.55	19.88	20.19	**19.87**	19.70	19.97	20.36	**20.01**	16.09	16.53	16.83	**16.48**	16.31	16.60	16.83	**16.58**
Mean		**19.36**	**19.77**	**20.12**	**19.75**	**19.61**	**19.90**	**20.27**	**19.92**	**15.98**	**16.33**	**16.78**	**16.36**	**16.26**	**16.50**	**16.82**	**16.53**
210	15	19.56	20.21	20.72	**20.16**	19.91	20.27	20.74	**20.31**	16.14	16.85	17.08	**16.69**	16.55	16.54	17.20	**16.76**
	30	19.85	20.63	20.93	**20.47**	20.18	20.71	20.90	**20.60**	16.53	17.16	17.41	**17.03**	16.78	17.19	17.39	**17.12**
Mean		**19.71**	**20.42**	**20.82**	**20.32**	**20.05**	**20.49**	**20.82**	**20.45**	**16.34**	**17.01**	**17.24**	**16.86**	**16.66**	**16.87**	**17.29**	**16.94**
P x F	15	**19.08**	**19.71**	**20.14**	**19.64**	**19.23**	**19.82**	**20.19**	**19.75**	**15.86**	**16.33**	**16.71**	**16.30**	**15.97**	**16.33**	**16.80**	**16.37**
	30	**19.53**	**20.05**	**20.34**	**19.97**	**19.73**	**20.11**	**20.40**	**20.08**	**16.20**	**16.70**	**16.94**	**16.61**	**16.34**	**16.71**	**16.89**	**16.65**
Mean of filter cake		**19.30**	**19.88**	**20.24**		**19.48**	**19.97**	**20.30**		**16.03**	**16.52**	**16.83**		**16.15**	**16.52**	**16.85**	
LSD at 0.5 level for:																	
Nitrogen levels (N)					**0.11**				**0.03**				**0.09**				**0.14**
Phosphorus levels (P)					**0.04***				**0.04***				**0.04***				**0.11***
Filter cake (F)					**0.04**				**0.04**				**0.04**				**0.11**
(N)x(P)					**0.07**				**0.08**				**NS**				**NS**
(N)x(F)					**0.07**				**0.07**				**0.07**				**0.19**
(P)x(F)					**0.06**				**0.05**				**0.05**				**0.15**
(N)x(P)x(F)					**0.10**				**0.09**				**0.09**				**0.26**

TABLE 7. Effective of nitrogen levels, phosphorus, filter cake and their interactions on purity and sugar recovery percentages in 2016/2017 and 2017/2018 seasons

Nitrogen levels (kg N/fad) (N)	Phosphorus levels (kg P_2O_5/fad) (P)	Purity%								Sugar recovery%							
		2016/2017 season				2017/2018 season				2016/2017 season				2017/2018 season			
		Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean
		0	2	4		0	2	4		0	2	4		0	2	4	
150	15	82.96	83.26	83.16	**83.46**	82.92	82.80	83.44	**83.06**	10.57	10.81	11.01	**10.80**	10.18	10.76	11.08	**10.67**
	30	83.30	83.49	83.33	**83.37**	82.50	83.12	82.53	**82.72**	10.78	11.10	11.19	**11.02**	10.64	11.00	11.01	**10.88**
Mean		**83.63**	**83.38**	**83.25**	**83.42**	**82.71**	**82.96**	**82.99**	**82.89**	**10.68**	**10.95**	**11.10**	**10.91**	**10.41**	**10.88**	**11.04**	**10.78**
180	15	82.83	81.96	83.41	**82.73**	83.08	82.78	83.25	**83.04**	10.65	10.70	11.30	**10.88**	10.91	11.00	11.33	**11.08**
	30	82.28	83.16	83.34	**82.93**	82.77	83.10	82.66	**82.85**	10.72	11.14	11.36	**11.07**	10.94	11.17	11.27	**11.13**
Mean		**82.55**	**82.56**	**83.37**	**82.83**	**82.93**	**82.94**	**82.96**	**82.94**	**10.69**	**10.92**	**11.33**	**10.98**	**10.92**	**11.09**	**11.30**	**11.10**
210	15	82.53	83.41	82.43	**82.79**	83.09	81.59	82.92	**82.53**	10.79	11.39	11.40	**11.19**	11.14	10.94	11.55	**11.21**
	30	83.25	83.18	83.18	**83.21**	83.14	83.01	83.18	**83.11**	11.15	11.56	11.73	**11.48**	11.30	11.56	11.72	**11.53**
Mean		**82.89**	**83.29**	**82.81**	**83.00**	**83.12**	**82.29**	**82.79**	**82.82**	**10.97**	**11.47**	**11.57**	**11.34**	**11.22**	**11.25**	**11.63**	**11.37**
P x F	15	**83.11**	**82.87**	**83.00**	**82.99**	**83.03**	**82.39**	**83.20**	**82.87**	**10.67**	**10.97**	**11.24**	**10.96**	**10.74**	**10.90**	**11.32**	**10.99**
	30	**82.95**	**83.28**	**83.29**	**83.17**	**82.80**	**83.08**	**82.79**	**82.89**	**10.88**	**11.27**	**11.43**	**11.19**	**10.96**	**11.24**	**11.63**	**11.18**
Mean of filter cake		**83.03**	**83.08**	**83.14**		**82.92**	**82.73**	**83.00**		**10.78**	**11.12**	**11.33**		**10.85**	**11.07**	**11.33**	
LSD at 0.5 level for:																	
Nitrogen levels (N)					**0.16**				**NS**				**0.07**				**0.18**
Phosphorus levels (P)					**0.12***				**NS**				**0.04***				**0.14***
Filter cake (F)					**NS**				**NS**				**0.04**				**0.14**
(N)x(P)					**0.20**				**NS**				**NS**				**NS**
(N)x(F)					**0.22**				**NS**				**0.06**				**NS**
(P)x(F)					**0.18**				**NS**				**0.05**				**NS**
(N)x(P)x(F)					**0.31**				**1.22**				**0.09**				**NS**

TABLE 8. Effect of nitrogen levels, phosphorus, filter cake and their interactions on cane and sugar yields/fed in 2016/2017 and 2017/2018 seasons.

Nitrogen levels (kg N/fad) (N)	Phosphorus levels (kg P_2O_5/fad) (P)	Cane yield ton /fad								Sugar yield ton/fad							
		2016/2017 season				2017/2018 season				2016/2017 season				2017/2018 season			
		Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean	Filter cake ton/fad (F)			Mean
		0	2	4		0	2	4		0	2	4		0	2	4	
150	15	49.492	52.350	53.969	**51.937**	49.107	51.437	52.757	**51.101**	5.233	5.660	5.941	**5.611**	4.998	5.534	5.847	**5.460**
	30	51.241	53.011	55.448	**53.232**	50.821	52.258	54.914	**52.664**	5.522	5.881	6.202	**5.869**	5.409	5.747	6.042	**5.733**
Mean		**50.366**	**52.680**	**54.708**	**52.585**	**49.964**	**51.847**	**53.836**	**51.883**	**5.378**	**5.771**	**6.071**	**5.740**	**5.204**	**5.641**	**5.944**	**5.596**
180	15	52.460	54.412	55.655	**54.176**	52.213	53.359	54.557	**53.376**	5.588	5.822	6.289	**5.899**	5.695	5.870	6.181	**5.915**
	30	53.577	55.602	56.900	**55.359**	53.124	54.567	56.061	**54.587**	5.745	6.191	6.463	**6.133**	5.809	6.098	6.318	**6.075**
Mean		**53.018**	**55.007**	**56.277**	**54.767**	**52.668**	**53.967**	**55.309**	**53.982**	**5.666**	**6.006**	**6.376**	**6.016**	**5.752**	**5.984**	**6.249**	**5.995**
210	15	54.442	56.246	58.212	**56.300**	54.213	55.787	57.645	**55.882**	5.875	6.404	6.637	**6.305**	6.083	6.100	6.657	**6.265**
	30	55.431	57.280	58.631	**57.114**	54.976	57.688	59.062	**57.242**	6.178	6.623	6.878	**6.560**	6.213	6.669	6.919	**6.600**
Mean		**54.936**	**56.763**	**58.421**	**56.707**	**54.594**	**56.738**	**58.354**	**56.562**	**6.026**	**6.513**	**6.757**	**6.432**	**6.125**	**6.385**	**6.788**	**6.433**
P x F	15	**52.131**	**54.336**	**55.945**	**54.138**	**51.844**	**53.528**	**54.987**	**53.453**	**5.565**	**5.962**	**6.289**	**5.939**	**5.577**	**5.835**	**6.228**	**5.880**
	30	**53.416**	**55.297**	**56.993**	**55.235**	**52.974**	**54.841**	**56.679**	**54.831**	**5.815**	**6.232**	**6.514**	**6.187**	**5.810**	**6.171**	**6.426**	**6.136**
Mean of filter cake		**52.774**	**54.817**	**56.469**		**52.409**	**54.184**	**55.833**		**5.690**	**6.097**	**6.402**		**5.694**	**6.003**	**6.327**	
LSD at 0.5 level for:																	
Nitrogen levels (N)					**0.185**				**0.252**				**0.043**				**0.118**
Phosphorus levels (P)					**0.177***				**0.078***				**0.031***				**0.078***
Filter cake (F)					**0.137**				**0.117**				**0.024**				**0.074**
(N)x(P)					**NS**				**0.135**				**0.055**				**NS**
(N)x(F)					**0.237**				**0.201**				**0.042**				**0.127**
(P)x(F)					**NS**				**0.165**				**NS**				**NS**
(N)x(P)x(F)					**0.335**				**0.285**				**0.059**				**0.180**

The results revealed that increasing level of filter cake supplied to sugarcanes to 2 up to 4tons/fad increased cane and sugar yields/fad in both seasons of sugar cane significantly by (2.043 and 3.695ton/fad) and (0.407 and 0.712ton/fad), compared to that recorded by canes left without filter cake, respectively, in the 1st season, corresponding to (1.775 and 3.424ton/fad) and (0.309 and 0.633ton/fad), in the 2nd season. These results could be referred to that the filter cake added some organic matter and nutrients to the soil used by cane plants (Table 2). These results in agreement with those obtained by Pakkiyappan & Saminathan (1999), Kumar & Verma (2002), Babu et al. (2005) Shankaraiah & Murthy (2005), Santos et al. (2010) and Abd- El-Kader (2017).

In the same table, the interaction between N levels and phosphorus NxP had a significant influence on cane yield (ton/fad) in the 2nd season and sugar yield in the 1st season only, the highest cane and sugar yield (57.242tons/fad and (6.650tons/fad) were obtained by applying 210kg N/fad and 30kgP_2O_5/fad.

As for, the interaction between N levels and filter cake NxF on cane and sugar yields was significant in both seasons, the highest yield of cane and sugar yields/fad obtained when adding 210kg N/fad with 4ton/fad filter cake.

The interaction between phosphorus and filter cake PxF on was significant effect on cane yield/fad in the 2nd seasons only. The highest yield 56.679tons/fad of cane, where the addition of super phosphate at rate 30kg P_2O_5/fad and filter cake of 4tons/fad.

The 2nd order interactions among the three studied factors had a significant effect on cane and sugar yields/fad in both seasons. Fertilization sugar cane by rate 210kg N/fad with added 30kg P_2O_5/fad and 4tons filter cake, give the highest cane and sugar yield which were (58.631 and 59.062tons/fad) and (6.878 and 6.910tons/fad) in the 1st and 2nd seasons, respectively.

Conclusion

It's known that nitrogen has a close relationship with yield and its components, where it plays a direct role on growth behavior and juice quality of sugar cane. There are significant effect on sugar cane productivity and quality resulted from applying fertilized at rate 210kg N/fad associated with 30kg P_2O_5/fad and filter cake at rate 4tons. In addation, The results obtained that increasing level of filter cake supplied to sugarcanes from 2 to 4tons/fad increased stalk weight kg/plant and number of millable cane/fad by (0.025 and 0.047kg/plant) and (0.758 and 1.298thousand/fad) compared to that recorded by canes left without filter cake, respectively

References

A.O.A.C. (1995) "*Official Methods of Analysis*", published by the A.O.A.C., Box, 540 Washington, D.C.

Abd El-Aal, A.M., El Shiekh, S.R.E. and Fergany, M.A. (2015) Ratooning ability of some sugarcane promising varieties under different levels of nitrogen fertilization. *Egypt. J. Appl. Sci.* **30**(1), 23-34.

Abd-El-Kader, M.F. (2017) Yield and physiological response of some new sugarcane cultivars to some cultural treatments. *Ph.D. Thesis,* Fac. of Agric., Assuit Univ., Egypt.

Ahmed, Z.A. and El-Shafai, A.M.A. (2007) Yield and quality of two sugarcane varieties as affected by bio and inorganic nitrogen fertilization. *J. Agric. Sci. Mansoura Univ.* **32**(1), 61-76.

Anonymous (1981) Chemical control in Egyptian sugar production factories. Jan., pp232.

Babu, M.V.S., Reddy, C.M., Kumari, C.R. and Reddy, T.Y. (2005) Effect of manure-fertilizer schedules on cane yield and leaf nutrient concentration at different growth phases of sugarcane (*Saccharum officinarum* L.). *Journal of Research ANGRAU,* **33**(2), 27-34.

Bekheet, M.A. and Abd El-Aziz, Rania M. (2016) Effect of row spacing, seed rate and nitrogen fertilization on yield and quality of sugarcane. *J. Biol. Chem. Environ. Sci.* **11**(3), 605-619.

Diego, H.S., Marcelo, A.S., Carlos, S.T. and Carlos, A.C.C.(2014) The effect of filter cakes enriched with soluble phosphorus used as a fertilizer on the sugarcane ratoons. *Acta Scientiarum. Agronomy,* **36**(3), 365-372.

Elamin, E.A., El-Tilib, M.A., Elnasikh, M.H., Ibrahim, S.H., Elsheikh, M.A. and Babiker, E.E. (2007)

Influence of phosphorus and potassium fertilization on quality of sugar of two sugarcane varieties grown on three soil series of Sudan. *J. of Applied Science,* **7**(16), 2345-2350.

El-Geddawy, I.H., El-Aref, A.O., Ibrahim, M.M. and Ali, A.M.K. (2012) Performance of some sugarcane varieties under nitrogen fertilization of sugarcane *Succharum officinarum* L. to the plant levels and harvesting dates. *Egypt. J. of Appl. Sci.* **27**(12), 520-539.

El-Sayed, G.S., Osman, A.M.H. and Ahmed, A.M. (2005) Effect of nitrogen, phosphorus and potassium fertilization on yield and quality of sugar cane. *Egypt, J. Agric. Res.* **83**(1), 241- 257.

El-Soghier, K.S., Osman, A.M.H. and El-Sayed, G.S. (2003) Response of ratoon crop of some sugar cane varieties to different doses of phosphorus fertilization. *Annuls of Agric. Sc. Moshtohor,* **41** (2), 489-501.

Freed, R.S.P., Eisensmith, S.P., Goetez, S., Recosky, D., Smail, V.W. and Wolberg, P. (1989) User's Guide MSTAT-C Software program for the design management and analysis of agronomic research experiments. Michingan State University, U.S.A.

Girma Abejehu (2015) Effect of filter cake and nitrogen fertilizer (Urea) on yield of sugarcane at Wonji-Shoa Sugar Estate Scholarly. *Journal of Agricultural Science*, **5**(4), 147-153.

Gomez, K.A. and Gomez, A.A. (1984) "*Statistical Procedures for Agricultural Research*", John Willey and Sons. Inc. New York.

Kalaimani, T. and Giridharan, S. (2001) Effect of pressmud on the control of sugarcane sett rot caused by Ceratocystisparadoxa Moreau. *Indian Sugar,* **50**(12), 863-865.

Kumar, V. and Verma, K.S. (2002) Influence of use of organic manure in combination with inorganic fertilizers on sugarcane and soil fertility. *Indian. Sugar J.* **52**(3), 177-181.

Mokadem, Sh.A., Atallah, S.A.A., Bekheet, M.A. and Gadalla, A.F.I. (2008) Effect of sources, levels and number of applications of nitrogen fertilizer on yield and quality of sugarcane. *Minia J. Agric. Res. Develop.* **28**(4), 767-783.

Nassar, A.M., El-Sagheir, K.S. and Ramadan, B.S.H. (2005) Effect of nitrogen levels on yield and juice quality of some sugar cane varieties. *Egypt J. Agric. Res.* **83**(2), 681-692.

Neana, Sh.M.M. and Abd El-Hak, K.A.E. (2014) Effect of irrigation regime and nitrogen fertilization levels on sugarcane yield and its components. *Alexandria Sci. Exchange J.* **35**(4), 288-294.

Osman, A.M.H., EL-Sayed, G.S., Osman, M.S.H. and Bekheet, M.A. (2004) Effect of planting density, mineral and biofertilizers of nitrogen and phosphorus on sugar cane productivity, *Egypt. J. Agric. Res.* **82**(2), 697-716.

Pakkiyappan, P. and Saminathan, S. (1999) Improvement of sugarcane production in tannery effluent polluted soils. *Madras Agric. J.* **86**(4-6), 202-206.

Santos, D.H., Tiritan, C.S., Foloni, J.S.S. and Fabris, L.B. (2010) Productivity of sugarcane under fertilization with filter cake enriched with soluble phosphate. *Tropical Agric. Res.* **40**(4), 454-461.

Santos, D.H., Silva, M.D.A., Tiritan, C.S. and Crusciol, C.A.C. (2014) The effect of filter cakes enriched with soluble phosphorus used as a fertilizer on the sugarcane ratoons. *Acta, Sci. Agron.* **36**(3), 365-372.

Shankaraiah, C. and Murthy, K.K. (2005) Effect of enriched press mud cake on growth, yield and quality of sugarcane. *Sugar Tech*. **7**(2-3), 1-4.

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تعزيز إنتاجيه وجوده قصب السكر عن طريق تطبيق النيتروجين و الفوسفور وطينه المرشحات

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أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بشندويل (دائرة عرض26.33 درجة شمالاً وخط طول 31.41 درجة شرقاً وإرتفاع 69 متراً عن سطح البحر) بمحافظة سوهاج خلال موسمى 2017/2016م و 2018/2017م لدراسة تأثير ثلاث مستويات من التسميد النيتروجينى 150 ،180 ، 210كجم نيتروجين/فدان و مستويان من الفوسفور 15، 30 كجم فوسفات/فدان خامس اكسيد الفوسفوروثلاث مستويات من طينة المرشحات بدون ، 2 ، 4 طن/فدان على جودة ومحصول قصب السكر للصنف جيزة 2003-47 فى تصميم قطاعات الكاملة العشوائية (القطع المنشقة مرتين فى ثلاث مكررات حيث وضعت مستويات النيتروجين فى القطع الرئيسية ومستويين الفوسفور فى القطع الشقية الأولى بينما وزعت مستويات طينة المرشحات عشوائيا فى القطع الشقية الثانية فى كلا الموسمين.

أوضحت النتائج أن زيادة التسميد النيتروجينى من 150 إلى210 كجم/فدان أعطى زيادة معنوية في طول وقطر العود ووزن العود وعدد العيدان القابلة للعصير و محصول العيدان والسكر وكذا البركس والسكروز وناتج السكرالنظرى في كلا الموسمين.

أدت إضافة الفوسفور بمعل 30 كجم/فدان خامس اكسيد الفوسفورعند زراعة قصب السكر للزيادة معنوية في طول وقطر العود ووزن العود وعدد العيدان القابلة للعصير ومحصول العيدان والسكر وكذا البركس والسكروز وناتج السكر النظرى في كلا الموسمين.

حققت إضافة 4 طن/فدان من طينة المرشحات عند الزراعة زيادة معنوية فى كلاّ من طول وسمك ووزن العود وعدد النباتات القابلة للعصير ومحصولى العيدان والسكر/فدان وأيضا في البركس% والسكر% وناتج السكرالنظرى فى الموسمين.

تحت ظروف هذا البحث يوصى بزراعة الصنف جيزة 2003-47 من قصب السكر مسمدا بى 210 مائتان وعشره كيلو جرام نيتروجين واضافه 30 كجم خاكس اكسيد الفوسفور مع اربعه طن من طينة المرشحات للحصول على أعلى محصول من القصب والسكر بالطن للفدان.