Response of sweet corn (zea mays saccharata L.) to different levels of organic and inorganic fertilizers* 2 - flowering and yield parameters

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Abstract

This study was conducted in the Agriculture research station of Chamchamal in Sulymaniyah / Iraq, on 3rd July to 8th October 2022. Was designed using a (RCBD) four *four with three replications. The arrangement of treatment is as follows, The first treatment was chemical fertilizer (NPK) consisting of four levels (0, 50, 75and 100)% of recommended application dose. The second treatment of two types of poultry manure (0, 4ton ha-1 domestic, 4ton ha-1 imported, and 2ton ha-1 from domestic and imported), results obtained from this study can conclude as follows. yield component (Days to 75% flowering (male and silk) appearance, number of row, weight of 500 grains and yield per plant, as well as the quantity of grains per row and cob)were significantly superior with the use of chemical and poultry manure application compared with the control, the better yield and its component of sweet corn was from the combination of two fertilizers(organic and inorganic) At the 50% of recommended inorganic fertilizer and 4 ton ha-1 of domestic poultry manure.

Key words: Inorganic, domestic, poultry, sweet corn, yield.
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Introduction

Maize (Zea mays L.) is the most important grain crop and has the most potential for production of any cereal grown today. It's important to the world's economy and is used for food, animal feed, and commercial grain crops. It is a main source of food for humans and animals, and it is also used in many industries. [1]. After rice and wheat, maize is the third most important grain crop in the world. It has a wide range of uses [2]. Most of the maize grown around the world is used. It is an important part of the human diet because it is rich in starch, proteins, fats, polyphenols, carotenoids, vitamins, and nutritional fiber. So, the same planting of corn would provide both food for people and feed for animals at the same cost[3], [4].

[5] explain the sweet corn as a cereal depends on different alleles which disrupt endosperm that responsible of starch synthesis that increase polysaccharides content of corn grains. Biochemical components such as protein, starch, sugar, neutral detergent fiber, and neutral cellulose digestibility were studied by [6] in Romanian sweet corn breeds. Although the United States, Canada, and Australia account for the vast majority of global sweet corn production and consumption, demand is on the rise in India and other Asian countries [7]. In addition, there are a few areas in Africa where sweet corn is grown, each with varying degrees of success. A fast rise in world population is predicted, driving up demand for crops to the point where it will double by 2050 [8]. In order to maximize crop output and preserve soil fertility, mineral nitrogen (N) applications are widely used today [9].

Sweet corn can get the nutrients it needs through fertilization. Farmers frequently employ inorganic fertilization techniques, such as using NPK fertilizer in the forms of Urea, SP 36, and KCl. Since plants can't survive without them, the soil must have a steady supply of nitrogen, phosphorus, and potassium at all times [10]. Phosphorus (P) fertilizer can significantly boost maize grain yields, however adding too much P fertilizer usually has no effect [11]. Several physiological and biochemical processes cannot occur without phosphorus (P) [12], making it a significant limiting nutrient for crop growth in many Agro ecosystems. As a result, all plant development is subject to the availability of phosphorus [13].

Water soluble and exchangeable potassium have emerged as key determinants impacting yields [14], although all recoverable soil potassium pools strongly affect potassium availability, absorption, and yield of maize that receives adequate irrigation.

Increased potassium uptake increases grain yields in arid environments [15]. Variations in uptake, growth, and usage of potassium among novel corn hybrids have been documented [16]. It's possible that crop production could be maintained if farmers used both organic and chemical sources of nutrients. Crop yields are improved through the combined use of organic and inorganic fertilizers. Organic manures have been shown to increase crop yields across the board [17]. Soil's physical, chemical, and biological qualities can be greatly enhanced by using organic manure, which is also environmentally beneficial, economically viable, and ecologically sound. Plants are able to take in more of the macro and micronutrients they need because organic manure makes the soil more stable and increases the amount of water it can store. [18]. The poultry manure (PM) was a more effective source of N, P and Mg and was more effective in increasing grain yield[19].

Organic fertilizers made from poultry manure were shown to be the most effective by [5] for boosting the development and output of sweet corn crops. Due to its higher concentration of N compounds, [20], PM is one of the organic manures most effective in boosting maize development and yields [21], [22]. When it comes to people's health, organic farmers recommend composting manures [23].

In addition to boosting soil fertility, the high concentrations of nitrogen and other nutrients in poultry manure have allowed for greater uptake of those nutrients by maize [24]. Therefore, an experiment was run to see how chemical and poultry manure fertilization together affected sweet corn.

Materials and methods

A field experiment was conducted during the summer season of 2022 at the Agricultural research station of Chamchamal. The study area is located in the east of Kirkuk city near about 45 km (Latitude: 35.49607161 Longitude 44.78628085 at an altitude of approximately height 895.94m from above sea level). The treat was designed with Randomized complete block design, with three replications . The size of the plot was, A total of 582 m² (41.6 m length and 14 m width) was the study area, consisting 48 plots with 3.5 m width by 2.1 m length. Each plot consists of five rows, The corn grain (two grains per hole) was sown at (3 – 5) cm depth, each plot has 60 plants, in all field consists of 2880 plants, sowing in3rd July 2022. Thinning to one plant per hole was conducted after 15 days from sowing, which made a plant population of 81632 plants per hectare. Weed control was performed both manually and mechanically. Pest and disease were controlled chemically, with pesticide and fungicide at the recommended rates, harvested after 90 days on 8th October 2022.

The seed variance use is Maize seeds (sweet corn ,cash F1) were obtained from the company (snowy river seeds).

Source of chemical and Organic Fertilizers.

Nitrogen applied as urea (46%)N at level of 200 Kg N ha-1, the application was in three doses. the first dose was applied before sowing, whereas the second dose was applied after thinning, the last dose at six weeks after germination. Supper phosphate with level 45Kg P ha-1that applied after dividing plots of

the experiment. Potassium sulphate (50%)K as a source of potassium with (200Kg K ha-1) applied in three equal doses, at the same times as nitrogen fertilizer application, these doses application according to [25], [26].

Organic fertilizers

The First one (domestic) was produced in Penjwein, district, sulymaniyah – Iraq made of chicken residues, 77 % organic matter.

Orgevit is the second option (imported),and it's generated from chicken waste, is chemical- and additive-free, contains no pathogens or weed seeds, has a low chlorine content, and is produced in accordance with European Union Regulation (EC) No. 1069/2009.

Methods of Analysis

Soil sample were collected randomly from the trite site and perpetrate for chemical and physical analysis as presented in (Table 1).

Table 1:-Some physical and chemical characteristics of the studied soil at (0 – 30 cm) soil depths

Soil characteristics	
Physical properties	
Sand g kg^{-1}	50
Silt g kg^{-1}	483.2
Clay g kg^{-1}	466.8
Soil texture	Silty clay
Chemical properties	
pH(1:2.5 water suspension)	8.2
Ece (dSm^{-1})	0.28
Soluble cations ($meql^{-1}$)	
Ca^{++}	2.5
Mg^{++}	2
Na^{+}	0.191
K^{+}	0.112
Soluble anions ($meql^{-1}$)	
HCO_3^-	2
Cl^-	0.4
O.M. (%)	1.33
$CaCO_3$ (%)	2.7
Soil nutrients content	
N g kg^{-1}	1.8
Available P mg kg^{-1}	2.26
Soluble K mg kg^{-1}	4.48

The used Treatments

Treatments were performed as follows:

T1= control or zero addition of chemical fertilizer and organic fertilizer .

T2= zero addition of chemical fertilizer and 4 ton ha^{-1} of organic fertilizer (domestic) .

T3= zero addition of chemical fertilizer and 4 ton ha^{-1} of organic fertilizer (imported) .

T4= zero addition of chemical fertilizer and 2 ton ha^{-1} of each organic fertilizer (domestic + imported) .

T5=50% of NPK recommended dose and zero addition of organic fertilizer .

T6=50% of NPK recommended dose and 4 ton ha^{-1} of organic fertilizer (domestic) .
T7=50% of NPK recommended dose and 4 ton ha^{-1} of organic fertilizer (imported) .
T8=50% of NPK recommended dose and 2 ton h^{-1} of each organic fertilizer (domestic + imported) .
T9=75% of NPK recommended dose and zero addition of organic fertilizer .
T10=75% of NPK recommended dose and 4 ton ha^{-1} of organic fertilizer (domestic).
T11=75% of NPK recommended dose and 4 ton h^{-1} of organic fertilizer (imported) .
T12=75% of NPK recommended dose and 2 ton h^{-1} of each organic fertilizer(domestic + imported) .
T13=100% of NPK recommended dose and zero addition of organic fertilizer .
T14=100% of NPK recommended dose and 4 ton h^{-1} of organic fertilizer (domestic).
T15=100% of NPK recommended dose and 4 ton ha^{-1} of organic fertilizer (imported).
T16=100% of NPK recommended dose and 2 ton ha^{-1} of each organic fertilizer (domestic + imported).

Measurement of yield and yield components

Number of days to 75% of the male and silk flowers to bloom, number of rows, the number of grains per row, number of grains per cob, and the weight of 500 grains were all figured out after the moisture content of the grains in each plot was changed to 15.5%, and the yield per plant of ten randomly chosen plants was used to figure out the average. The sweet corn was harvested at maturity week after planting (12 WAP) and the following yield data were taken:

Days to 75% flowering: Days to 75% male and silk showing was the number of days it took for 75% of the plants to flower from the day they came up to the day they had male and silk flowers. This was done in each plot and for each treatment.

Number of rows per cob: The average number of rows per cob was calculated by counting and averaging the rows on each cob from each of the ten plants.

Number of grain per rows: The average quantity of grains per row was calculated by counting and tallying the grains on each of the ten plants.

Number of grain per cob: Total number of grain per cob from the ten plants was counted, averaged and expressed as number of grain per cob.

Weight of 500 seeds (g)

The weight of 500 grains (15.5 % moisture content) weighed to the nearest gram was determined. three replicate samples of 500 seeds per plot were measured to obtain the mean weight per plot. The mean 500 grains weight from the middle row was used to compute the score for each plot.

Yield per plant and plot: The weight of total grain in plant(15.5 % moisture content) were measured in ten plant was in middle three rows from each plot.

$$\text{Weight at moisture15.5\% = 100 - original humidity} * \frac{\text{(field) original weight.}}{84.5}$$

According to [26], [27].

Data analysis

The Statistical Analysis System was used to analyse the data collected from the experiment (SAS., 2001) and to create Analysis of (ANOVA) tables. Means compared the least significance difference (Duncan multiple range test) to test probability levels at ($P \leq 0.05$).

Results and discussion .

Effect of chemical fertilizer, types and levels of organic fertilizers on flowering and yield of sweet corn.

Number of days to appear male flowers

The results in table (2) represented that there are significant effects between chemical fertilizer levels compared with control on number of days to appear male flowers, the earliest male flowering was from (100%) recommended application of chemical fertilizer (35.000 days), where's the longest male flowering was from control (38.833 days).

Also in type and levels of organic fertilizers there was significant effects between them ,earliest male flowering was from domestic (35.917) days, where's the longest from control (38.000) days.

The interaction between chemical fertilizer levels, type and levels of organic fertilizer affected significantly($p \leq 0.05$) on number of days to appear male flowering, the earliest male flowering (33.667 days), obtained from interaction 100% of recommended chemical fertilizer and 2 ton ha^{-1} of both organic fertilizers and the longest (41.333 days) obtained from control of chemical and tow type of organic fertilizers. These results agree with [2],[28] on sweet corn.

Table(2): Effect of chemical fertilizer levels, types and levels of organic fertilizer on the Number of days to appear male flowering in sweet corn.

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	41.333 a	37.667 bcd	38.333 abc	38.000 bcd	38.833 a
50% r.	39.667 ab	36.000 cde	35.000 cde	36.333 bcde	36.750 b
75% r.	36.000 cde	35.000 cde	34.667 de	36.667 bcde	35.583 cb
100% r.	35.000 cde	35.000 cde	36.333 bcde	33.667 e	35.000 c
Mean	38.000 a	35.917 b	36.083 b	36.167 b	

*P.M.=poultry manure.

Number of days for silk appearance

The results in table (3) explain that there are significant effects between chemical fertilizer levels compared with control on number of days for silk appearance , the earliest silk appearance was from (100%) of chemical fertilizer recommended application (46.083 days) ,where's the longest silk appearance was from control (49.833 days) . Also in type and levels of organic fertilizers there was significant effects between them ,earliest silk appearance was in ½(domestic + Imported) (46.917 days), where's the longest from control (49.000) days.

The interaction between chemical fertilizer levels , type and levels of organic fertilizer affected significantly($p \leq 0.05$) on number of days for silk appearance, the earliest silk appearance (45.000 days), obtained from interaction 100% of recommended chemical fertilizer and 2 ton ha^{-1} of both organic fertilizers ,the longest (52.333 days) obtained from control of chemical and tow type of organic fertilizers. These results agree with [29] on maize

Table (3) Effect of chemical fertilizer levels, types and levels of organic fertilizers on the Number of days for silk appearance in sweet corn.

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	52.333 a	48.667 bcd	49.333 abc	49.000 bcd	49.833 a
50% r.	50.667 ab	47.000 cde	46.000 cde	47.333 bcde	47.750 b
75% r.	47.000 cde	46.000 cde	45.667 de	47.667 bcde	46.583 bc
100% r.	46.000 cde	46.000 cde	47.333 bcde	45.000 e	46.083 c
Mean	49.000 a	47.250 b	47.083 b	46.917 b	

*P.M.=poultry manure.

Number of row in cob

The results in table (4) showed that there were no significant effects between chemical fertilizer levels compared with control on number of row in cob, but types and levels of organic fertilizer had significant effects on number of row, the highest value in domestic

organic fertilizer (13.458)where's the lowest value from control (11.733) with the rate of increase 14.7%.

The interaction between chemical fertilizer levels, types and levels of organic fertilizers affected significantly($p \leq 0.05$) on number of row per cob, the highest value (13.967) obtained from interaction (50% of recommended chemical fertilizer and4 ton ha^{-1} of domestic) and the lowest value(10.433) obtained from control of chemical and two types of organic fertilizers, with the rate of increase 33%, These results agree with [30] on maize.

Table (4): Effect of chemical fertilizer levels, types and levels of organic fertilizers on number of row in cob of sweet corn .

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	10.433 c	13.300 ab	12.733 abc	13.633 a	12.525 a
50% r.	12.433 abc	13.967 a	13.933 a	12.833 abc	13.292 a
75% r.	11.700 abc	13.233 ab	11.867 abc	13.533 a	12.583 a
100% r.	12.367 abc	13.333 ab	12.100 abc	10.700 bc	12.125 a
Mean	11.733 b	13.458 a	12.658 ab	12.675 ab	

*P.M.=poultry manure.

Number of grain per row

The results in table (5) showed that there are no significant effects between chemical fertilizer levels compared with control on number of grain per row, but types and levels of organic fertilizers had significant effects on number of grain per row, the highest value in domestic organic fertilizer (29.367) where's the lowest value from control (23.533) with the rate of increase24.7%.

The interaction between chemical fertilizer levels, types and levels of organic fertilizers affected significantly($p \leq 0.05$) on number of grain per row, the highest value (31.467) obtained from interaction (50% of recommended chemical fertilizer and 4 ton ha^{-1} of domestic organic fertilizer) and the lowest value(20.067) obtained from control of chemical and two types of organic fertilizers, with the rate of increase 56.8%. These results agree with [31] on maize which they found that number of rows per cob increased by increasing of poultry manure .

Table(5) Effect of chemical fertilizer levels, types and levels organic fertilizers on number of grain per row in cob of sweet corn.

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	20.067 d	26.200 abcd	25.600 abcd	25.800 abcd	24.417 a
50% r.	23.467 bcd	31.467 a	27.867 abc	25.267 abcd	27.017 a
75% r.	25.600 abcd	30.267 ab	25.400 abcd	29.267 abc	27.633 a
100% r.	25.000 abcd	29.533 abc	25.933 abcd	22.533 cd	25.750 a
Mean	23.533 b	29.367 a	26.200 ab	25.717 b	

*P.M.=poultry manure.

Number of grain in cob

The results in table (6) showed that there are no significant effects between chemical fertilizer levels compared with control on number of grain in cob, but types and levels of organic fertilizers had significant effects on number of grain per cob, the highest value in domestic organic fertilizer (399.07) where's the

lowest value from control (285.25) with the rate of increase 39.9%.

The interaction between chemical fertilizer levels, types and levels of organic fertilizers affected significantly($p \leq 0.05$) on number of grain per cob, the highest value (440.55) obtained from interaction (50% of recommended chemical fertilizer and 4 ton ha^{-1} of domestic organic fertilizer) and the lowest value(217.25) obtained from control of chemical and two types of organic fertilizers, with the rate of increase 102.7%. These results agree with [32] on mays plant.

Table(6): Effect of chemical fertilizer levels, types and levels of organic fertilizers in number of grain in cob of sweet corn

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	217.25 c	353.87 abc	338.56 abc	352.43 abc	315.53 a
50% r.	296.43 abc	440.55 a	390.37 ab	326.02 abc	363.34 a
75% r.	308.70 abc	401.50 ab	305.25 abc	400.34 ab	353.95 a
100% r.	318.62 abc	400.36 ab	316.92 abc	247.51 bc	320.85 a
Mean	285.25 b	399.07 a	337.78 ab	331.58 ab	

*P.M.=poultry manure.

Weight 500 grains (g)

The results in table (7) showed that there are no significant effects between chemical fertilizer levels compared with control on weight of 500 grains (g), but types and levels of organic fertilizer had significant effects on weight of 500 grain, the highest value in 1/2(domestic + imported) organic fertilizer (122.067 g) where's the lowest value from control (113.342 g) with the rate of increase 7.6%.

The interaction between chemical fertilizer levels, type and levels of organic fertilizers affected significantly ($p \leq 0.05$) on weight of 500 grains, the highest value (124.067) obtained from interaction (100% of recommended chemical fertilizer and 4 ton ha^{-1} of domestic organic fertilizer) and the lowest value(109.200) obtained from 50% of recommended chemical fertilizer and zero addition of organic fertilizers, with the rate of increase 13.6% These results agree with. [33] on maize plant that they found increasing of thousand grains weight with increasing of potassium application

Table(7): Effect of chemical fertilizer levels, types and levels organic fertilizers on weight of 500 grains (g) in sweet corn .

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	117.300 ab	113.633 ab	116.567 ab	121.833 ab	117.333 a
50% r.	109.200 b	118.933 ab	120.067 ab	121.067 ab	117.317 a
75% r.	114.333 ab	114.367 ab	117.467 ab	123.567 ab	117.433 a
100% r.	112.533 ab	124.067 a	117.500 ab	121.800 ab	118.975 a
Mean	113.342 b	117.750 ab	117.900 ab	122.067 a	

*P.M.=poultry manure.

Yield per plant (g)

The results in table(8) showed that there are significant effects between chemical fertilizer levels compared with control on yield g $plant^{-1}$, the highest value was from 50% of recommended chemical fertilizer application(84.99 g) where's the lowest was from control (72.50 g) with the rate of increase 17%, also in type and levels of organic

fertilizers had significant effects between type and levels , the highest value in domestic organic fertilizer (93.26 g) where's the lowest value from control (62.72 g) with the rate of increase 48.6% .

The interaction between chemical fertilizer levels, types and levels of organic fertilizers affected significantly ($p \leq 0.05$) on yield (g plant$^{-1)}$, the highest value (104.5 g) obtained from interaction (50% of recommended chemical fertilizer and 4 ton ha^{-1} of domestic organic fertilizer) and the lowest value (49.1 g) obtained from control of chemical and two types of organic fertilizers, with the rate of increase 112.8% These results agree with [34] on maize plants that they found an increase of yield by increasing of nitrogen and poultry manure levels.

Table(8): Effect of chemical fertilizer levels, types and levels organic fertilizers on yield per plant (g) in the sweet corn.

Chemical fertilizer levels	Organic fertilizer levels				Mean
	0	P.M. domestic	P.M. Imported	½(domestic + Imported)	
0	49.1 p	79.2 g	76.0 i	85.7 f	72.50 d
50% r.	63.7 n	104.5 a	93.2 d	78.5 h	84.99 a
75% r.	68.5 m	91.6 e	70.8 k	97.9 b	82.19 b
100% r.	69.6 l	97.7 c	73.7 j	58.7 o	74.94 c
Mean	62.72 d	93.26 a	78.45 c	80.20 b	

*P.M.=poultry manure.

Discussion

Sweet corn yield parameters were significantly superior with the use of chemical and poultry manure application compared with the control, the better yield and its component of sweet corn may be to the combined effect of two fertilizers, days to mail and silking was delayed with high rates of NPK and poultry manure levels. application of manure resulted in earlier days to tasseling and silking. After using chicken manure and inorganic fertilizer, the plants grew strong leaves and had more physiological processes going on, which helped them make more photo assimilates and ripen earlier. These results are the same as those of [35], who saw a decrease in the number of days it took for corn to reach 75% tasselling as the amount of organic and inorganic fertilizers used went up. [36] found that manure improved the soil's physical and biological properties. Even in small amounts, manure gave all of the necessary macro- and micro-nutrients in usable forms, which helped the roots of sweet corn grow better and led to higher yield components.

More readily available nutrients from PM throughout the growing season are the primary explanation for the rise in grain yield and rows per cob caused by the use of domestic poultry manure. application of manure and mineral fertilizer to maize crop can be as effective for yield response. Number of grains per row is also an important parameter contributing towards the yield.

The balanced supply of nutrients from inorganic and poultry manure during the grain filling and growth stage led to a significant increase in 500-grain weight [37],[31]. The results demonstrate that a fertilizer blend is more effective than either inorganic fertilizer (NPK) or poultry manure alone. Similar findings were made by [38] on mays, where they discovered that the highest values of (4.009 and 8.533) ton ha^{-1} were achieved from

plots treated with lesser inorganic and organic fertilizers. [39] found that organic, inorganic, and varying ratios of the two greatly influenced sweet corn production. Thus integrated use of PM and(NPK) not only improved the crop productivity but also helped to maintain the soil health.

Conclusion

The use of each of the chemical or organic fertilizers alone gave the lowest yield compared to the interaction between the levels of the two fertilizers. The use of chemical fertilizer levels (50-75)% with 4 ton ha^{-1} of the two organic fertilizers resulted in the highest plant dry matter yield by an increase of 48%, and this means that we can reduce the fertilizer recommendation by (25-50)% of chemical fertilizer when added with poultry manure.

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استجابة الذرة السكرية (Zea mays saccharata L.) لمستويات مختلفة من السماد العضوي و غير العضوي
2- التزهير و مكونات الحاصل

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- البحث مستل من رسالة ماجستير للباحث الاول

المستخلص

اجريت هذه الدراسة في محطة البحوث الزراعة جمجمال / السليمانية في الثالث من تموزالى الثامن من تشرين الاول 2022، لدراسة استجابة الذرة السكرية لمستويات الاسمدة العضوية و الكيميائية اذ صممت تجربة عامية (4*4) لتصميم القطاعات العشوائية الكاملة (RCBD) و بثلاث قطاعات قسمت معاملة التسميد الكيميائي (NPK) بتجزئة التوصية السمادية الى اربعة اجزاء (0و50و75و100)% من التوصية السمادية ، في حين نوعين من السماد العضوي (مخلفات الدواجن) احدهما محلي والاخر مستورد باربعة مستويات (0 و 4 طن هكتار$^{-1}$ لكل سماد و (2+2) طن هكتار$^{-1}$ لكل سماد) ، وتضمنت التجربة النمو والزهري (الفترة من الزراعة لظهور 75% من النورة الزكرية والانثوي) ومكونات الحاصل (عدد الصفوف لكل عرنوص وعدد الحبوب للصف وعدد الحبوب في العرنوص ووزن 500 حبة فضلا عن حاصل النبات الواحد وحاصل حاصل الوحدة التجريبية) اذ بين النتائج التفوق المعنوي لمستويات السماد العضوي والكيماوي لوحدهما او تداخلاتهما مقارنة بمعاملة المقارنة وان اقصى حاصل تم الحصول عليه من معاملة التداخل 50% من التوصية السمادية للسماد الكيميائي و(4 طن هكتار$^{-1}$) للسماد العضوي المحلي.

الكلمات المفتاحية: سماد الدواجن،المحلي،الذرة السكرية،الحاصل.