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EFFECT OF ACTIVE DRY YEAST AND ORGANIC MANURE ON ROSELLE PLANT

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Abstract

Field trials were conducted in Egypt during two successive seasons 1996 and 1997, to assess the effect of active dry yeast and farm yard chicken and animal manure on the growth, fruiting and active substances of roselle plant (*Hibiscus sabdariffa* L.)

The active dry yeast were applied as foliar spray with the three concentrations 0, 1 and 2 gm/L during different stages of growth. The data showed that the treatment with 2gm/L. with the vegetative, flowering and fruiting stage improving significantly growth, yield of calyxes and active substance.

Chicken and animal manure which were treated at the level 14, 18, 25 and 27 m3 feddan enhanced the growth, quantity and quality of calyxes, particularly at the low rates.

INTRODUCTION

Roselle plant (*Hibiscus sabdariffa*) Fam. Malvaceae, now cultivated in Egypt, is a small bush, originally from the Sudan Ceylon, and tropical region of Mexico. The dried fleshy sepals contian a red water soluble pigment, a mixture of organic acids (malic, citric, tartaric) and hibiscus acid. It tastes acid tonic, well tolerated by patients with fever. It also used to give medicine an acidic flavor and as a refreshing lissome which is mildly iaxative, it is also prepared as sachets of powdered rose hip teas Paris (1977). It has antibacterial and fungal and diuretic activities Caceres *et al.* (1987), Guerin and Reveillere, (1984); Shihata *et al.* (1983). Furthermore, the seeds are a source of vegetable oil and proteins Al-wandawi *et al.*, (1984); Rukmini, (1985).

Biofertilization of Horticultural crops had drawn the attention of research workers and had become in the last few decades a positive alternative to chemical fertilizers. Biofertilizers are reasonably more safer to the environment compared to nitrogen chemical fertilizers.

The various positive effect of applying active dry yeast was attributed to

its own contents of different nutrients, high percentage of protein, larger amounts of vitamin. B and natural plant growth regulators such as cytokinins. In addition, of soluble phosphate will readily only combine with cation in soil solution to form low solubility substances called phosphate fixation. This is dominant with high soil pH and greater percentage of calcium carbonate. Soil microorganisms which convert the insoluble form of phosphorus to soluble one play an important role in supplying the plants with available phosphorus. (Ahmed *et al.*, 1997).

Subba Rao (1984) and Ahmed *et al.* (1995) mentioned that active dry yeast as a foliar fertilizer enhanced growth and trees nutritional status.

Ahmed *et al.*, (1997) on Red Romy grapevines revealed that fertilizing the vines with active dry yeast caused material improvement in shoot length, leaf area and thickness, and effectively enhanced the nutritional status of the vines. In the addition, a great promotion on growth and nutritional status of Red Roomy grapevines occurred as a result of supplying the vines with active dry yeast as foliage spraying at 0.1%.

Akl *et al.*, (1997) found that the improvement occurred in berry set, yield and physical and chemical properties in vines treated with active dry yeast as foliar spray at 0.1%.

Concerning chemical analysis of the active dry yeast, Ahmed *et al.*, (1997) found that the dry yeast contained, protein 34.87%, ash 7.55%, Glycogen 6.54%, fats 2.9% and cellulose 4.92%.

N.R.P. (1977) Reported the analysis of dry yeast which revealed and it was dry matter 93%, protein 47.2% arginine 2.6% glycine 2.6%, histidine 1.4%, isolaysine 2.9%, lauicine 3.5%, lysine 3.8%, methionine cystine 0.6%, phenyl-alanine 3%, tyrosine 2.1%, threonine, 2.6% tryptophan 0.5%, and vitamin B 2.9%.

Concerning the effect of farm yard manure on some plants and soil, Njaroge *et al.*, (1990) on a studying of the effect of planting hole size and farm yard manure rates on *Arabic coffee*, it was found that for good establishment, the planting hole should not be less than 45 x 45 cm in size and the FYM rate should not exceed 50% of mixture with top soil.

Aflatuni *et al.* (1993) studied the effect of manure composter with drum compositor on aromatic plants majoram, hysop, oregano, ami, shyssop, pepperment, caraway, basil and dragonhead. The composted manure was used to obtain No.4 -1.0

Kg/100m^3 Another soil which plants transplanted had been treated with inorganic fertilizer of composted manure to give the same N content (0.4 - 1.0 kg N/100 m^2) herb dry matter yields were greater with manure for majoram, oregano and pepperment. The percentage content of essential oil was higher for plants fertilized with manure with the exception of peppermint.

The following review concerns the effect of application FYM on the soil and nutrients:

Organic manure holds moisture, maintains sufficient pore spaces to permit good air circulation and drainage of the excessive water produced and composts from plant residues and animal dropping, are one type of humus which contributes to the soil fertility (Schachtschable, 1979).

Zhang *et al.* (1993) stated that application of pig and cattle manure increased all P fraction in soils. The availability of P from manures increased after incubation because of the transformation of moderately label and resistant P fractions into label P fraction.

Patiram (1994) found that application of goat manure increased organic matter content, pH, CEC, potential K buffering capacity and exchangeable K, Ca, and Mg, which decreasing exchangeable all surface samples of acidic.

MATERIALS AND METHODS

Experiment 1

This investigation was carried out during two successive growth seasons of 1996 and 1997 at the experimental farm of Kaha Research Farm (Kaluobia), A.R.C.

Seeds of roselle (*Hibiscus sabdariffa*, L.) (cvs. Shia 17 light red) were sown in the nursery bed on April, 3rd in both seasons. After 45 days and when the seedlings were reached 15 cm height, they were transplanted, and each plot contained 4 rows (60 cm wide with 4m length), the area of each plot was (4 x 2.4 m2), seedlings were planted 50 cm. apart.

The application of active dry yeast (*Saccharomyces cerevisiae*) was used as foliar spray with three concentrations (0, 1 and 2 gm./L.) during the growing season and the treatments were as follows:

1. Once at the vegetative stage (July 15th).

2. Once at the flowering stage (Aug. 28th).
3. Once at fruiting stage (Sep. 25th).
4. Three times at vegetative, at flowering and at fruiting stages.

The design of the experiment was split plots with three replicates, the main plots were the number of spras, the plants received and the sub plots were the different concentrations used of the dry yeast.

Soil analysis was carried out in Water and Soil Lab. (A.R.C), and the obtained results are shown in Table a. The plants did not receive any of chemical fertilizers and all agricultural practices were undertaker.

At harvest stage (Oct. 15th) the following data were recorded per plant:

1. Plant height. 2. Number of branches.
3. Fresh and dry weights of the aerial parts of plant without fruits.
4. Number and weights of fresh fruits.
5. Fresh and dry weights of calyxes.
6. Seed yield.

The acid was determined by the titration with 0.1 NaoH. A known volume of the water extract was used. The results were calculated as citric acid (A.O.A.C. 1962).

The extraction of total anthocyanins pigments was done by using Ethyl alchol. According to the method described by Tribor and Francis (1968) and the determination of total anthocyanins was made according to the method of Fuleki and Francis (1968), developed by Du and Francis (1973).

Fixed oil of seeds was extracted by using hexane in soxhlet apparatus.

Results obtained were statistically analyzed according to the method described by Steel and Torrie 1980 using N.L.S.D.

Table a. Analytical data of the soil at the experiment field.

Season	EC dsM-1	Cations me/L				Anaions Me/L			
		Ca++	Mg++	Na+	K+	Co3--	HCO-3	CL-	So4--
1st	0.49	1.38	0.85	1.60	5.22	-	2.25	0.94	0.86
2nd	0.59	1.65	1.32	2.00	0.22	-	2.13	1.88	1.40

1:5 Soil water extr.

Experiment II

Field trials were conducted during two seasons of 1996 and 1997 at the experimental Kaha Research Farm (Kalubia).

Two kinds of farm yard manure were used, the first was chicken manure and the animal manure was the second one. The chemical analysis of fertilizers and the soil were done at Water and Soil Lab. (A.R.C) obtained results are shown in tables (a) and (b). Seed were sown in nursery bed on 3rd Apr. Four levels of either fertilizers were used and mixed well before experimentation.

Seedlings were transplanting to the field after 45 days from the sowing (15 cm). Each plot contained 4 rows (60 cm. Wide) with 3m. length). The area of each plot was 3 x 2.4m^2.

The design of the experiment was split-split plots with three replicatcs, the main plots were the kind of FYM, and the sub plot, were the different of manure levels and the sub-sub were the planting spaces.

The four rates of each fertilizer were 14, 18, 25 and 27m3/fed. and the planting distancees were 40, 50 and 60 cm.

The plants didn't receive any chemical fertilizers and all the agricultural practiccs were performed.

At harvest stage (October 12th) the data were recorded as mentioned in the experiment I.

The acid,total anthocyanin and fixed oil were done as described in experiment I.

RESULTS AND DISCUSSION

Experiment I:

1. Effect of spraying active dry yeast on the vegetative growth of roselle plant

It is evident from the data in Fig. 1 and 2 that the application of active dry yeast as a foliar spray improved the growth of plants (plant height, number of branches and fresh and dry weights of the aerial parts of plant). By increasing the concentration plants growth was more improved.

The data also showed that, the growth of roselle plant significantly increased when the plant received three applications at vegetative, flowering and at fruiting stages.

The maximum growth was obtained when the plant were treated with 2gm/L at the three growth stages.

II. Effect of spraying active dry yeast on the fruiting of roselle plant

II. 1: Number and weight of fresh fruits

Data in Fig. 2 obviously revealed that spraying different concentrations of active dry yeast significantly increased both the number fresh weight of fruits than the untreated plants. The data also showed that there were statistically significant increases in number and weight of fruits when the plants were treated at the three growth stages at the rate of 2 gm/L.

Table b. Analytical data of chicken and animal manure before adding to the experiment.

Organic Fertilizer Report	Chicken Manure		Animal Manure	
	1st Season	2nd Season	1st Season	2 nd Season
Weight of m3/kg (denisty)	265	260	332	340
% Humidety	6.9%	8.70	7.6%	8.0
Total nitrogen, %	3.35%	4.1646	1.2%	1.1789
Amonia, mg/kg	910.1	930.1	1.172	1.27.3
Nitrate, mg/kg	71.3	75.9	917.0	930.1
Total phosphorous %	0.4%	0.73	0.29%	0.68
Total potassium, %	2.15%	1.896	1.75%	1.8565
Organic matter,%	74.34%	36.7615	45.19%	39.4672
Organic carbon,%	43.12%	21.322	27.95%	22.8915
Ash, %	60.121%	63.2389	23:29	60.5328
C:N ratio	5.0:1	5.1:1	18.3:1	19.4:1
Micro elements mg/kg;				
* Iron	8342.3	8548.6	25346.0	26163.0
* Manganese	196.8	212.5	349.9	327.8
* Copper	50.1	41.2	42.9	43.0
* Zinc	783.8	792.9	80.3	79.3

Fresh and dry weights of calyxes-and seed yield

Data presented in Table 1 indicate that there was a significant difference in the frech and dry weights of roselle calyxes and seed yield when the plants were treated with the active dry yeast was done compared to the control. The data also showed that the fresh and dry weights of calyxes significantly increased by increasing the concentrations of dry yeast.

The maximum yield of calyxes and seeds was optained when the plants received 2gm/L active dry yeast at the different stages of plant growth.

The heighest yield of dry calyxes per fed. was 462 kg resulting from treatment with (2gm/L dry yeast at the three growth stages).

Effect of spraying active dry yeast on the active substances of roselle plant during different stages:

Data in Tables 1 show that the active substances of roselle plant (total anthocyanine %, acidity % and fixed oil %) were affected by the application of dry yeast. The total anthocyanine and acidity % significantly increased by increasing the concentration. They significantly increased when the plants were treated with the different concentrations at the three growth stages. The maximum percentage were obtained when the plant were treated with 2 gm/L.

Seed oil % insignificantiy increased by increasing the concentration of the dry yeast.

The important role of yeast in enhancing the growth and yield of roselle plant could be attributed to its greater content of minerals particularly N, P and K and certain natural hormones. In addition, the increase in the release of carbon dioxide through fermentation process effectively stimulates photosynthesis and accelerates the biosynthesis of carbohydrates. Also, yeast is probably responsible for facilitating the opening of stomata in the leaves as well as serving as wetting agent for the spraying solutions. The beneficial effect of yeasts on plants was supported by the results of Tarrow and Nakase (1975) and Subbo Rao (1984). They showed that active dry yeast contains high amounts of four vitamins, especially B which plays an important role in improving growth and controlling the incidence of fungi diseases. It contains some natural plant growth regulators such as cytokinins. The application of active dry yeast reduced at a low extent the great use of insecticides which caused an adverse effect on growth and productivity of the plant.

Table 1. Effect of active dry yeast treatments on fruits number and on the dry weight of calvxes (gm) during different staages of roselle plant growth in 1996 and 1997.

Concen.of Active dry yeast gm.l	Fruits number										Dry weight of Calyx									
	1st Season					2nd Season					1st Season					2nd Season				
	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st.	Mean value
	Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.		
0.0	24.00	24.00	24.00	24.00	24.00	46.00	46.00	46.00	46.00	46.00	6.67	6.67	6.67	6.67	6.67	12.00	12.00	12.00	12.00	12.00
1.0	60.67	37.33	46.00	109.00	63.30	81.00	89.33	89.33	87.33	86.75	4.5	6.67	11	18.43	10.15	15.33	25.33	22.55	24.00	21.8
2.0	45.67	34.00	35.67	136.33	63.02	76.00	122.60	77.67	88.67	91.25	11.00	14.67	17.37	20.5	15.89	17.83	23.67	26.00	27.67	24.04
Mean value	43.44	31.77	35.22	89.77		67.67	86.00	71.00	7400		7.39	9.34	11.68	15.20		15.05	20.67	20.18	21.22	

Experiment II

1. The effect of kind and levels of manure, and planting spaces on the vegetative growth, per plant:

The application of the chicken and animal manure as organic fertilization at the rates of 14, 18, 25 and 27 m3/Feddan under different spacing had clear effect on the vegetative growth of roselle plant.

Plant height :

Data presented in Fig. 3 indicate that providing rosolle plants with different levels of organic manure produced significant differences in plant height. Planting spaces produced also significant differences. The distance 50 cm was the most suitable in this respect.

The application of chicken and animal manure as organic fertilizers had no effect on plant height the differences were insignificant.

Conccrning the combined effect of three factors on plant height, the interaction between the levels of manure and planting spaces were statistically significant. On the other hard the combined effect of the source and rates of manures showed in significant differences.

The interaction between the three factors showed a similar trend. These results were observed during the two seasons.

Number of branches :

Data shown in Fig. 3 indicated that the application of different rates of organic manure showed significant differences in number of branches. The data also ineicated that the second level of chicken manure (18 m3/Feddaan.) produced the highest number of branches. These results were observed in the two seasons.

Concerning the effect of kind of manure on the branches number, the data was insignificant in the first season while, it was significant in the second one.

As for the interaction of the factors under study data showed that there were significant differences when the kind of manure was combined with both planting distances and different levels of chicken and animal manure. The combined effect of planting distances with the four levels of organic manure underwent the same trend.

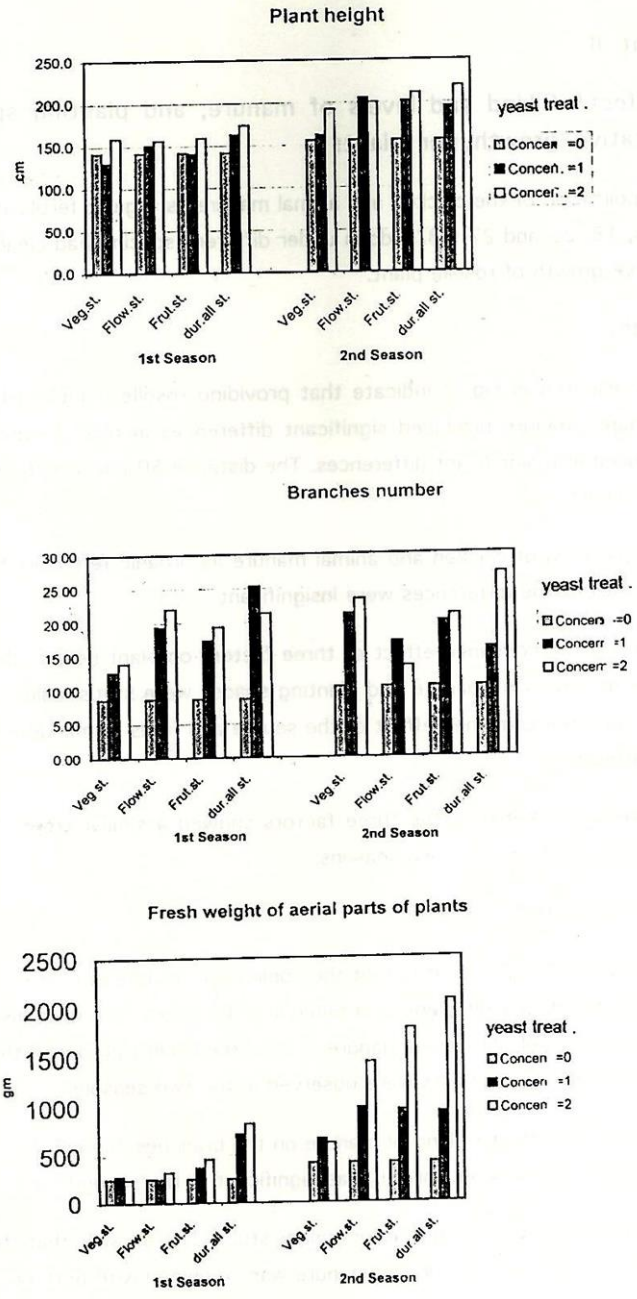

Fig. 1. Effect of dry yeast on plant height, number of branches and fresh weight of aerial parts of plants seasons of roselle plant during 1996 and 1997.

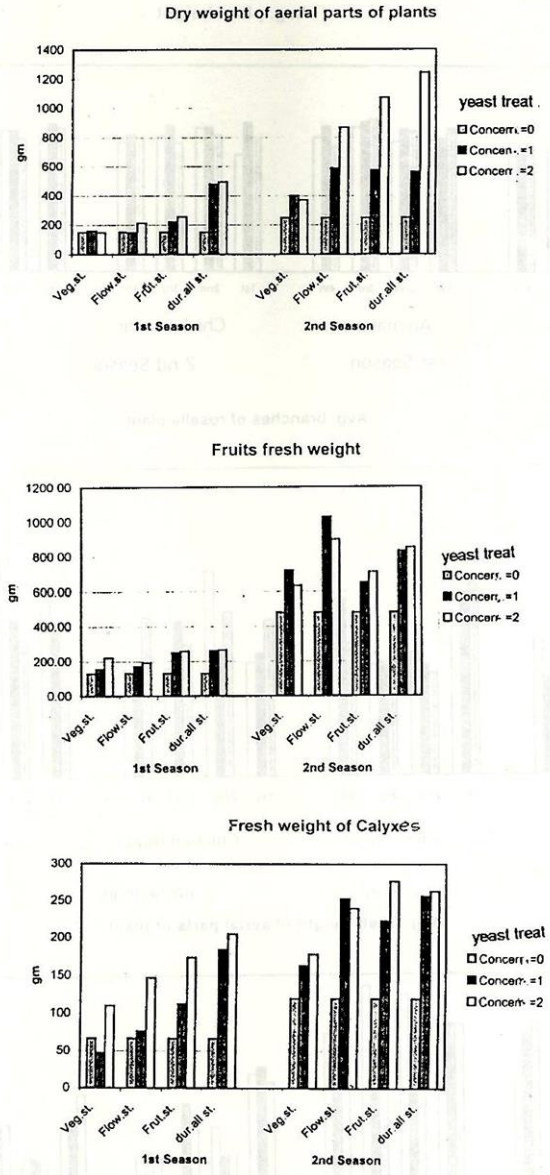

Fig. 2. Effect of dry weight of aerial parts of plants, fruits fresh weight and fresh weight of calyxes of roselle plant during 1996 and 1997.

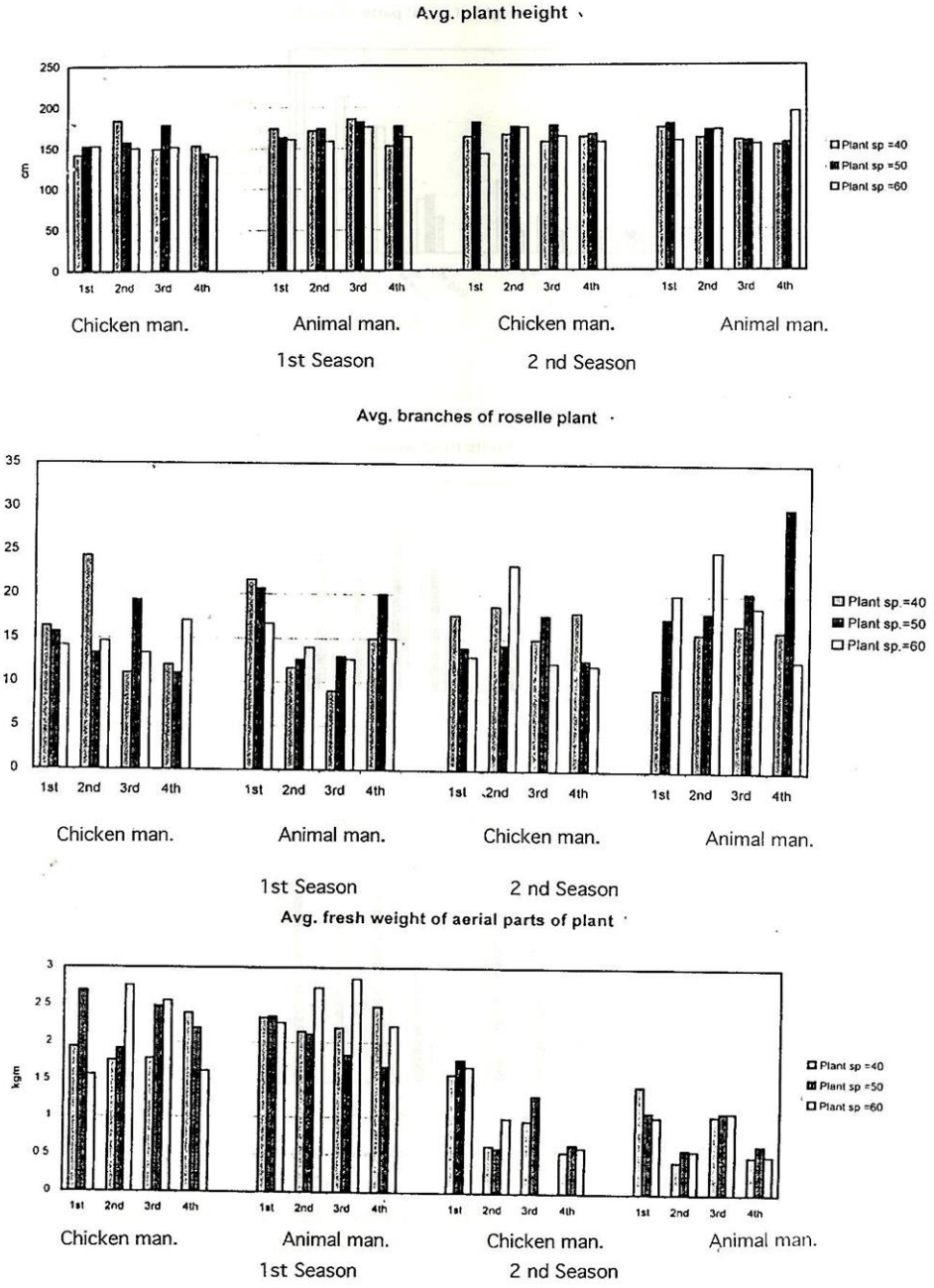

Fig.3. Interactive effect of kind, levels of manure and planting space on plant height, avg. branches and fresh weight of erial parts of plant of roselle plant during 1996 and 1997.

The interaction between the three factors showed insignificant differences for branch number. These results were similar in the two seasons.

Fresh and dry weight of the aerial parts of plant :

Data presented in Fig. 3 and 4 revealed that there were significant differences in the fresh and dry weight of the plants when were treated with ckicken and animal manures. These trends were observed when the plants were planted with different spaces. The distance 50cm was the best treatment.

The interaction between the rates of manures and planting distances were statistically significant, while the interaction between the different kinds of manure with the rates of application showed insignificant differences in both seasons.

The effect of kind and levels of manure, and planting spaces on the fruiting:

Number of fruits

The obtained results in Table 4. show that the type of manures had insignificant effect on the number of fruits per plant.

On the other hand the different levels of manure and different spaces had significant effect on the number of fruits.

The interaction between the planting space with both levels and kind of manure were statistically significant and the best result was attained from the treatment, (60 cm) space and the lowest rate of chicken manure.

The combined effect of the kind of manure with different planting spaces was insignificant, the combined between three factors also insignificant.

Fruit fresh weight :

Data recorded in Table 5. showed that the application of different levels and different spaces showed significant differences in fruit fresh weight.

The data also showed that the interaction between the kinds of manure with both the rates of application and planting distances were statistically significant. The interaction between the different rates and different spaces showed a similar trend.

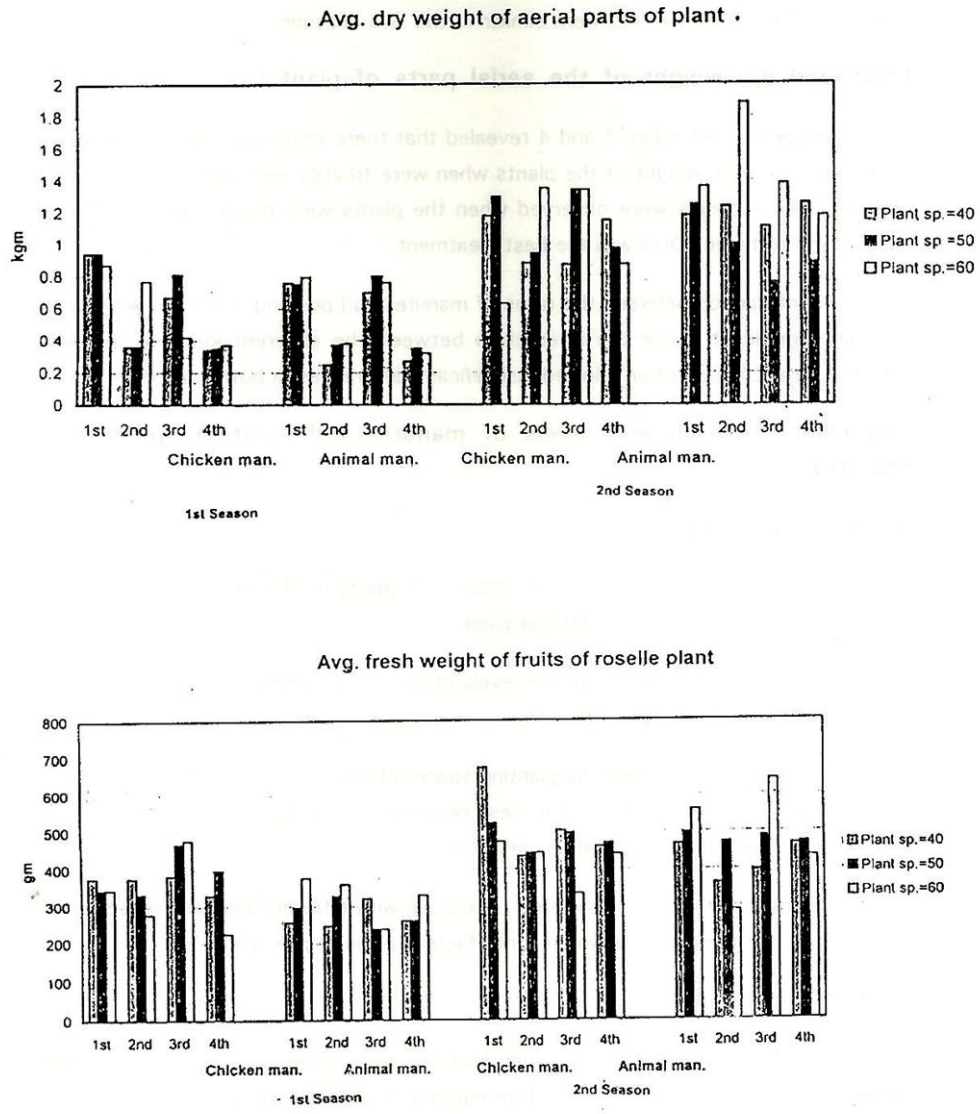

Fig.4. Interactive effect of kind, level of manure and planting space on fresh and dry weight of aerial parts of plant and of rosell plant during 1996 and 1997.

Table 2. Effect of active dry yeast treatments on seed yeild and on fixed oil % during different stages of roselle plant growth in 1996 and 1997.

Concen.of Active dry yeast gm.l	Seed yield										Fixed oil %									
	1st Season					2nd Season					1st Season					2nd Season				
	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st	Mean value	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st.	Mean value
	Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.		
0.0	66.67	66.67	66.67	66.67	66.67	101.7	101.67	101.67	101.67	101.67	15.67	15.67	15.67	15.67	15.67	18.16	18.16	18.16	18.16	18.16
1.0	56.67	98.33	130.00	151.67	109.16	165	180	240	223.33	202.08	16.31	21.57	20.65	17.54	19.02	19.66	19.66	21.49	22.26	20.77
2.0	150.00	91.33	183.33	151.67	144.08	233.3	203.33	290	430	289.17	20.44	20.01	19.33	19.37	19.79	21.07	21.07	23.87	23.66	22.42
Mean value	91.11	85.44	126.67	123.34		166.7	161.67	210.56	251.67		17.47	19.08	18.53	17.53		19.63	19.63	21.17	21.63	

Table 3. Effect of active dry yeast treatments on total anthoynine % and on titratable acidity % of calyxes during different stages of roselle plant growth in 1996 and 1997.

Concen.of Active dry yeast gm.l	Seed yield										Fixed oil %									
	1st Season					2nd Season					1st Season					2nd Season				
	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st	Mean value	One time during			Three tim. dur.all st.	Mean value	One time during			Three tim. dur.all st.	Mean value
	Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.			Veg.st.	Flow. st.	Frut.st.		
0.0	1.2	1.2	1.2	1.2	1.2	1.63	1.63	1.63	1.63	1.63	2.93	2.93	2.93	2.93	2.93	2.07	2.07	2.07	2.07	2.07
1.0	1.8	2.70	2.23	2.90	2.41	3.31	2.67	3.57	3.4	3.19	3.7	3.8	4.97	3.50	3.99	2.73	3	2.63	3.77	3.03
2.0	2.43	1.77	2.23	2.50	2.23	3.1	3.80	3.03	3.3	3.31	2.37	3.60	3.93	3.67	3.39	3.8	5.77	5.27	5.3	5.04
Mean value	1.81	1.89	1.88	2.20		2.63	2.70	2.74	2.78		3.00	3.44	3.93	3.37		2.87	3.61	3.32	3.71	

Table 4. Interactive effect of kind and levels of Organic manure and Planting space on average number of reselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	183.00	173.67	165.67	138.67	165.25	179.67	163.33	162.00	156.00	165.95	256.00	244.00	234.69	285.33	255.05	261.33	225.67	255.67	253.67	249.08
50	178.67	157.33	166.67	139.67	160.58	176.67	166.67	170.00	156.33	167.41	262.00	265.00	259.00	279.33	266.33	252.33	284.33	230.67	260.33	256.92
60	180.00	159.33	153.33	142.67	160.08	182.00	165.33	171.33	168.67	171.83	263.00	222.67	264.00	290.67	260.08	242.33	255.33	239.00	255.00	247.92
Mean value	180.55	163.44	161.89	140.33	161.55	179.44	165.11	167.77	160.33	168.16	260.33	243.89	252.56	285.11	260.47	251.99	255.12	241.78	256.33	251.31

New L.S.D at 0.05		1996	1997
For	: Kind of manure	4.47	N.S.
	: Levels of manure	18.50	N.S.
	: Planting space	N.S.	N.S.
	: Kind X Levels	N.S.	N.S.
	: Kind X Space	13.31	19.43
	: Levels X Space	24.90	35.09
	: Kind X Levels X Space	33.98	49.63

Table 5. Interactive effect of kind and levels of Organic manure and Planting space on average fresh weight of fruits of roselle (gm) of roselle plant during two seasons 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	376.33	376.67	384.00	330.67	366.92	257.33	247.33	322.00	260.67	271.83	675.00	435.00	503.33	460.00	518.33	466.67	362.00	396.67	466.67	423.00
50	345.00	333.33	468.33	397.33	385.99	297.33	327.67	238.33	260.67	281.00	523.33	442.67	496.67	469.33	483.00	496.00	471.67	488.33	471.67	481.92
60	345.67	278.33	478.33	226.00	332.08	376.67	360.33	238.33	330.00	326.33	473.33	443.33	333.33	439.00	422.25	558.00	288.33	641.67	433.33	555.33
Mean value	355.67	329.44	443.55	318.00	361.67	310.44	311.78	266.22	283.78	293.10	557.22	440.33	444.44	442.00	471.00	506.89	474.00	508.89	457.22	486.75

New L.S.D at 0.05		1996	1997
For	: Kind of manure	14.36	N.S.
	: Levels of manure	25.59	33.75
	: Planting space	8.89	29.68
	: Kind X Levels	33.87	49.05
	: Kind X Space	12.45	30.13
	: Levels X Space	16.23	50.27
	: Kind X Levels X Space	21.62	67.03

On the other hand the interaction between the kind of manure, four rates of application and planting spaces were statistically insignificant. These trends were observed during two seasons.

Fresh and dry weights of calyxes :

The obtained results in Table 6 and 7 revealed significant differences in fresh and dry weights of calyxes when the chicken and animal manure applied, the planting distances indicated a similar trend. The best space was 50cm which produced the highest yield of calyxes.

On the other hand there were insignificant differences in fresh and dry weights of calyxes when the plants received different levels of organic manure and the third level of chicken manure showed the highest weight in both seasons.

Concerning the interaction between the kind of manure and different spaces, the results were significant.

The combination between the different levels of manure, kind of manure and different spaces were insignificant, while the interaction between the three factors showed the same trend. These results were observed during the two seasons.

The data also showed that the yield of dry weight of calyxes per feddan was 420kg, it was obtained from providing the 18m3/Feddan chicken manure at the space 50cm.

Seed yield:

Data reported in Table 8 show that the kind of manure, different rates of application and planting space had insignificant effect on the seed yield of roselle plant.

The interaction between different spaces with the kind of manure and their rates were statistically significant, while the interaction between the three factors was insignificant. These results were similar during the two seasons.

The highest seed yield per feddan was obtained when the plants received the second level of chicken and animal manures ($18m^3$/Fed.), it was calculated per feddan and it ranged from 2220 to 2225 kg, respectively.

The effect of kind and levels manure, and planting spaces on the active substances of rosell plant:

Table 6. Interactive effect of kind and levels of organic manure and planting space on average fresh weight of calyxe (gm) of roselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	320.00	268.00	282.00	260.67	282.67	292.67	245.00	243.33	246.67	256.92	316.33	307.00	327.67	272.00	305.75	275.00	291.67	299.00	298.33	291.00
50	314.00	351.67	338.33	271.67	318.92	245.00	276.67	261.67	350.00	283.34	336.67	339.33	356.00	374.67	351.67	324.00	304.00	313.67	311.67	313.34
60	256.00	235.00	328.33	271.67	272.75	315.00	295.00	243.33	277.33	281.92	301.33	318.33	323.67	338.00	320.33	355.67	290.67	306.33	294.33	311.75
Mean value	296.67	284.89	316.22	268.00	291.45	284.22	272.22	249.44	291.33	274.30	318.11	321.55	335.78	328.22	325.92	318.22	295.46	306.33	301.44	305.36

New L.S.D at 0.05 For		1996	1997
	: Kind of manure	14.38	10.48
	: Levels of manure	N.S	N.S.
	: Planting space	9.91	11.61
	: Kind X Levels	52.94	N.S
	: Kind X Space	14.01	18.50
	: Levels X Space	20.75	33.42
	: Kind X Levels X Space	28.01	36.49

Table 7. Interactive effect of kind and levels of organic manure and planting space on average fresh weight of calyxe (gm) of roselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	32.00	26.00	28.20	24.40	27.65	29.27	24.70	24.37	24.63	25.74	31.70	30.90	32.87	31.78	31.78	27.30	29.10	29.50	29.67	28.89
50	30.83	34.00	33.70	27.37	31.475	24.57	27.57	26.13	34.97	28.31	33.60	34.00	33.33	37.33	34.57	32.17	30.33	31.00	31.27	31.19
60	23.33	23.67	32.77	27.13	26.725	31.50	29.43	24.13	27.73	29.19	30.37	31.83	32.33	33.77	32.08	35.80	29.07	30.63	29.43	31.23
Mean value	28.72	27.89	31.57	26.30	28.62	28.45	27.23	24.88	29.11	27.41	31.89	32.24	32.85	34.24	32.81	31.76	29.50	30.38	30.12	30.44

New L.S.D at 0.05		1996	1997
For	: Kind of manure	1.20	0.66
	: Levels of manure	N.S	N.S.
	: Planting space	0.91	1.23
	: Kind X Levels	3.29	3.44
	: Kind X Space	1.29	1.86
	: Levels X Space	1.82	3.38
	: Kind X Levels X Space	1.89	4.11

Table 8. Interactive effect of kind and levels of organic manure and planting space on average seed yield (gm) of roselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	78.00	92.67	90.00	87.00	89.92	61.33	60.67	71.33	68.33	65.42	196.67	174.67	160.67	179.67	177.92	162.67	164.00	188.00	163.67	169.42
50	78.00	68.67	69.33	78.00	70.25	62.33	67.33	66.00	82.33	69.49	183.33	174.67	174.67	156.00	172.33	165.00	187.67	183.33	174.33	177.58
60	66.67	68.33	69.67	65.00	67.42	67.33	76.00	84.67	76.00	76.00	186.00	169.00	169.00	166.67	172.67	193.67	193.67	182.00	164.33	178.42
Mean value	74.22	76.56	76.33	76.67	75.95	63.66	68.00	74.00	75.55	70.30	188.67	172.78	168.33	167.45	167.45	167.11	181.78	184.44	167.44	175.19

New L.S.D at 0.05

For	1996	1997
: Kind of manure	4.26	N.S.
: Levels of manure	N.S	11.61
: Planting space	4.26	N.S
: Kind X Levels	N.S.	14.69
: Kind X Space	5.04	5.22
: Levels X Space	9.36	8.24
: Kind X Levels X Space	15.39	10.44

Data recorded in Table 9,10 and 11 show the effect of the three factors under study on the active substances of roselle plant (anthocyanin, acidity% of calyxes and oil % of seed).

The data show generally that the kind of manure and different planting spaces had significant diffences. The combination between the different factors also showed the same trend.

The highest percentages were obtained from applying animal manure with the second or the third rates.

The values of total anthocyanin and titribable acid % was similar to those obtained by Abou El Fadel *et al.* (1993) and Khater and Ahmed (1992).

The percentage of fixed oil of seed were the same to those obtained by Abou El Fadl *et al.*, (1993) and Khater and Ahmed (1992).

The percentage of fixed oil of seed were the same was those obtained by (Al-Wand awi *et al.*, 1984).

The organic fertilizers improve the growth and quality of the product and this is due to the effective role of the organic fertilizers in improving the growth of the plant and its qualitative properties as it improves the properties of soil and providing the plant with nutrient elements with their micro or macro elements which are esscntial to plant.

Our results with organic fertilizers and effects on roselle plant were in accordance with those obtained by El Nadi *et al.* (1995) they stated that chicken manure contained the principal elements needed for plant growth. It also had characteristic, which makes its application to soil many advantages, it has a large content of nutrients and greater water holding capacity and is also simple and easy to handle.

Tran *et al* (1995) studied the application of cattle manure on the availability of soil phosphorus. They found that the application of manure to make signficantly increased the resin-Na Hco^3, NaoH-pi and pt, and increased soil pi forms and maintained po fraction.

Nitrates and other elements were analyzed chemically in calyxes of roselle plant to reecognize that, if the application of organic manure with the toxic materials are safe for human being. It was found from the analysis that these elements are

Table 9. Interactive effect of kind and levels of organic manure and planting space on average total anthocyanins (%) of roselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	1.57	3.30	2.60	2.37	2.46	3.77	1.63	2.47	3.8	2.92	3.33	3.93	5.63	6.07	4.74	2.90	2.47	4.57	3.37	3.32
50	2.17	3.47	2.97	2.97	2.89	2.50	2.50	2.37	2.47	2.46	2.50	4.53	7.13	4.27	4.61	3.67	3.93	2.83	4.00	3.61
60	2.20	4.00	2.40	3.00	2.90	2.67	4.70	2.47	2.80	3.16	3.73	2.90	3.33	5.53	3.87	4.90	5.33	3.37	4.50	4.51
Mean value	1.98	3.59	2.66	2.78	2.75	2.98	2.94	2.44	3.02	2.85	3.19	3.79	5.36	5.29	4.41	3.82	3.91	3.59	3.96	3.81

New L.S.D at 0.05		1996	1997
For	: Kind of manure	N.S.	0.11
	: Levels of manure	0.50	0.45
	: Planting space	0.26	N.S.
	: Kind X Levels	0.71	0.63
	: Kind X Space	0.34	0.34
	: Levels X Space	0.49	0.52
	: Kind X Levels X Space	0.16	0.73

Table 10. Interactive effect of kind and levels of organic manure and planting space on average titribable acid (%) of roselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	1.57	7.7	6.77	5.00	5.24	3.7	7.57	3.5	13.50	7.99	5.00	6.47	3.47	6.1	5.26	7.97	4.6	7.20	4.80	6.14
50	5.50	1.80	12.3	3.47	5.78	4.97	8.77	7.6	7.17	7.13	6.27	6.20	7.50	5.7	5.06	6.5	4.47	7.00	9.57	6.89
60	4.97	3.47	4.97	5.20	4.65	6.20	11.47	3.5	4.53	6.43	4.50	7.27	6.10	6.30	6.04	5.50	6.10	7.63	8.00	6.81
Mean value	4.01	4.32	8.01	4.56	4.96	4.96	9.27	4.87	8.40	7.18	5.26	6.65	5.76	6.03	6.66	6.66	5.06	7.27	7.46	6.61

New L.S.D at 0.05 For	1996	1997
: Kind of manure	0.67	0.34
: Levels of manure	0.94	N.S.
: Planting space	0.74	0.34
: Kind X Levels	1.25	1.5
: Kind X Space	N.S	N.S
: Levels X Space	1.34	0.69
: Kind X Levels X Space	1.91	0.97

Table 11. Interactive effect of kind and levels of organic manure and planting space on fixed oil (%) of seed of roselle plant during two season 1996 and 1997 per plant.

Planting Space cm	1st Season										2nd Season									
	Chicken manure Levels of manure					Animal manure Levels of manure					Chicken manure Levels of manure					Animal manure Levels of manure				
	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means	1st	2st	3rd	4th	Means
40	18.43	18.05	19.43	18.65	18.65	15.75	19.49	18.22	18.12	17.90	19.42	21.00	17.56	19.72	19.43	16.33	18.62	17.08	20.49	18.13
50	18.58	19.41	20.03	19.30	19.30	19.45	20.36	19.13	19.29	19.29	20.07	21.39	20.71	20.31	20.62	20.07	19.92	18.23	18.60	19.21
60	19.82	17.58	20.67	19.51	19.51	16.45	17.90	19.17	17.73	17.73	20.42	19.22	21.85	21.51	20.75	17.73	18.70	19.35	18.30	18.25
Mean value	18.94	18.35	20.04	19.16	19.16	17.22	19.25	18.84	18.30	18.30	19.97	20.53	20.04	20.51	20.26	18.04	19.08	18.22	19.13	18.62

New L.S.D at 0.05

For	1996	1997
: Kind of manure	0.07	0.17
: Levels of manure	0.72	0.84
: Planting space	0.34	0.32
: Kind X Levels	1.01	N.S.
: Kind X Space	0.48	0.50
: Levels X Space	0.68	0.65
: Kind X Levels X Space	1.02	0.92

less than the allowed valances for toxicity i.e. the highest levels of organic manures (25 m^3/Feddan) was safe.

RECOMMENDATION

1. It can be recommended to use active dry yeast as foliar spary with 2gm/L three times at the different stages of plant growth.

2. Organic manure (chicken or animal) could be used to enhance the growth and fruiting with a good yield of dry calyxes without using chemical fertilization.

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تأثير الخميرة والاسمده العضويه على نبات الكركديه

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أجرى هذا البحث فى مزرعه بحوث الخضر بقها فى تجربتين لدراسة تأثير الخميره والأسمده العضوية (سماد الكتكوت وسماد الحيوان) على النمو الخضرى والثمرى ومحصول السبلات الجافة والمواد الفعالة الموجودة فى نبات الكركدية فى موسمين زراعيين ١٩٩٦ / ١٩٩٧ ,

التجربة الأولى: تأثير الخميرة:

إستعملت الخميرة بثلاث تركيزات هى (صفر ، ١جم/لتر ، ٢جم/لتر) رشا على النباتات فى مراحل نمو النبات (نباتات تم رشها بالتركيزات السابقة بمرحلة النمو الخضرى واخرى فى مرحلة النمو الزهرى وثالثة فى مرحلة النمو الثمرى. بينما رشت نباتات اخرى بنفس التركيزات فى الثلاثة مراحل.

التجربة الثانية: إستخدام سماد الكتكوت وسماد الحيوان:

وقد استعمل من كل اربعة مستويات (١٤ – ١٨ – ٢٥ – ٢٧م٣ / للفدان) كما استخدمت ٣ مسافات للزراعه هى (٤٠ – ٥٠ – ٦٠ سم)

وكان من اهم نتائج البحث:

اولاً: تأثير الخميرة:

لعبت الخميرة دورا فعالا فى تحسين نمو النبات الاخضر والثمرى وكذلك المواد الفعاله وكانت افضل المعاملات هى رش النباتات بتركيز ٢جم/لتر ٣ رشات فى جميع مراحل نمو النبات – واعطت هذه المعاملة ٤٦٢ كجم سبلات جافة/للفدان حسابيا.

ثانياً: تأثير الاسمدة العضوية:

أ – التأثير على النمو الخضرى:

١) كان لتأثير العوامل الثلاثه تحت الدراسة تأثيرا كبيرا على نمو نبات الكركديه فقد وجد ان نوع السماد والمستويات المستخدمه ومسافات الزراعه كل على حدة له تأثيرا معنويا على النمو الخضرى (طول – عدد افرع – وزن النبات الطازج والجاف) وكانت المسافة ٥٠ سم هى افضل مسافات الزراعة.

٢) كان للتفاعل بين كل عاملين من العوامل الثلاثه تحت الدراسة تأثيرا معنوياً.

٣) لا يوجد تأثير معنوى فى حالة استخدام العوامل الثلاثه معا.

ب – التأثير على النمو الثمرى والمواد الفعالة:

١) وجد ان نوع السماد والمستويات المختلفه للسماد ومسافة الزراعه كل على حدة له تأثير واضح على عدد ووزن الثمار ووزن السبلات الطازجة والجافة وكذلك محصول البذره.

٢) اظهرت النتائج تأثيرات معنويه فى حالة تفاعل كل عاملين من العوامل الثلاثه موضوع الدراسة.

٣) التفاعل بين العوامل الثلاثه معا له تأثير غير معنوى وكان أعلى محصول من السبلات الجافه (٤٢٠ كج للفدان ومحصول البذرة ٢٢٢٠ كجم تم الحصول عليهم عند تسميد النباتات بالمستوى الثانى من سماد الكتكوت مع مسافة زراعة ٥٠ سم.

وننصح بأستخدام الخميره رشا على نبات الكركديه وايضا استخدام سماد الكتكوت او السماد البلدى بالمعدلات ١٤ – ١٨ م٣ / للفدان حيث ان هذه المعاملات استخدامها آمن وغير ضار ويعطى محصول جيد من السبلات الجافة يوازى ما يعطيه استخدام الأسمدة الكيماوية مع ملاحظة ان هذه السبلات لا يوجد بها آثار كيماويه نتيجة استخدام الأسمدة العضوية.