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EFFECTS OF SOME CHEMICAL, ORGANIC AND BIO FERTILIZERS ON SEED YIELD AND YIELD COMPONENTS OF KAFER EL-SHAIKH COWPEA VARIETY AND ITS RELATIONSHIP WITH RUST DISEASE INFECTION.

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ABSTRACT

Two field experiments were carried out during the two successive summer seasons of 2014 and 2015 at the experimental farm of the Environmental Studies And Research Institute, University of Sadat City to study the effect of some chemical, organic and bio fertilizers on seed yield and its components as well as rust disease infection of Kafer EL-Shaikh cawpea cultivar. seven treatments were used in addition to control treatment.. Results indicate the treatment of 50% NPK +Rhizobia + Homic + Microbin and 50% NPK + Rhizobia + Homic were the best among all tested treatments where both of them gave an average high-yield and some of its components compared with the other treatments in both seasonsAs for rust disease, the low percentage of infection has always been linked to the presence of humic acid and in some cases with the compost, on the other hand, the ratio was high percentage of infection in most cases linked to the existence of chemical fertilizer and sometimes the presence of rhizobia, or both together. The treatment 50% NPK + Rhizobia +Homic+Microbin was the best while it give the lowest percentage of infection under the four periods in the two seasons. The recommended added rates were as follows: 50% NPK. (16.5kg N+ 30 kg P_2O_5 + 25kg K_2O) +2kg commercial rhizobia + 4L commercial homic +5L commercial microben / feddan.
Keywords: Cowpea organic, bio and chemical fertilizers, rust percentage.

INTRODUCTION

Cowpea (*Vigna unguiculata*) is one of the most important food legume crops in the semi-arid countries. The growers utilize chemical fertilizers as a supplemental source of nutrients but they do not apply in reasonable quantity (Islam *et. al.*, 2011). Even with balanced use of only chemical fertilizer, high yield level could not be maintained over the years because of decline in soil physical and biological environments. Organic matter improves the physical, chemical and biological properties of the soil which improve the crop productivity and yield (Micheni *et al*., 2004). Along with those factors, a major limitation to crop production in huge scale is the texture and the chemical composition of soils. Altering the texture through sand modifications increased the bulk densities of the soil (Eugène *et al*., 2010). Numerous factors associated to soil fertility limit agricultural production. Soil form, farmer's practices, crop residues and mineral fertilizers organization are those factors which manipulate crop yields (Bationo *et al*., 2012). Organic fertilizers elevate the organic matter in the soil. In turn, organic matter discharges the plant food in obtainable form for the utilization of crops. They provide organic acids that facilitate dissolve soil nutrients and make them available for the plants. Reduction of soil fertility is a main limitation for higher crop production (Madukwe *et al*., 2008). Appropriate arrangement of organic and inorganic sources of nutrients is necessary for sustainable crop yields.amendments in agriculture has enhanced over the years (Sangakkara, 1993). Organic manures include (i) Farmyard manure (FYM), (ii) Compost, (iii) Green manure, (iv) Vermi compost. Organic manure is a vital resource of raw or incompletely decayed organic matter which improves soil tilt, penetration velocity and soil water holding capacity to give nutrient to the crop (Alijanpour,*et al*., 2014). Bio fertilizers are a natural product carrying living microbes resulting from the root or cultivated soil. They aid in stimulating the plant growth hormones providing better nutrient uptake and improved tolerance towards drought and moisture stress. These microbes are potential tools for sustainable agriculture and a trend for the future (Toyota and Watanabe, 2013).

Therefore, the present study was under taken to estimate the effect of organic and inorganic fertilizers on yield, yield components and susceptibility to rust disease of Cowpea plants.

MATERIALS AND METHODS

Two field experimentswere carried out during the two summer growing seasons of 2014 and 2015 at the experimental farm of the Environmental Studies and Research Institute, University of Sadat City to study the effect of some chemical, organic and bio fertilizers and their combinations treatments on seed yield and its components and susceptibility of rust disease of Kafer EL-Shaikh cawpea cultivar. The treatment code , treatments and treatments components and amounts are presented in Table 1.In the two seasons 2014 and 2015 the cawpea cultivar Kafr EL-Shaikh was sown at 14th April under the eight treatments i.e. Control (100% NPK) , 50% NPK. + Rhizobia , 50% NPK. + Rhizobia + Microben, 50% NPK. + Rhizobia + Homic , Compost + Rhizobia + Homic + Microbin , Compost + Rhizobia andCompost + Rhizobia + Homicwith recommended added rates were as follows33 kg N/ fedd., 60 kg P2O5/fedd., 50 kg K2O/fedd.2kg Rhizobia/fedd,5kg Microben/fedd., 4L Homic/fedd. and $30m^3$ Compost/ fedd. in an experiment designed in complete randomized design with three replicates. The experimental plotarea was 13.50 m^2which included 3 rows of 5 m a long and 0.9 m width. The seeds were sown in one side of the ridge with plant space 25cm and two seeds per hill and all recommended practice will done on the time. The treatments applied after 30 days from sown with natural infection as a land addetion for NPK, Rhizobia and Compost and spray for Microben and Homic acid. In each plot thirty leaflets were chosen randomly with three canopy levels: top, middle and bottom were rated nondestructively each week till the pods were ready for harvest in according with the method of Imhoff *et.al.* (1982). Five categories were suggested to estimate the severity on rusted leaves using a scale in which 0,1,2, 3, 4 and 5 signified that 0, 1-10, 11-25, 26-50, 51-75 and 76-100 %the leaf surface was covered with pustules, as found by Claudia *et.al.* (1992). The rust percentage was recorded estimates by vision at 25, 30th June and 5, 7th July after 70, 75, 80 and 85 days from sowing in the two seasons. Meanwhile, seed yield and seed components were estimated in ten random plants from each plot at harvest.

Table (1): The Number of treatment, treatments code and treatments components.

Code	Treatment	Amounts
T1	Control (100% NPK)	33kg N+ 60kg P2O5+ 50 kg K2O / feddan
T2	50% NPK. + Rhizobia	16.5kg N+ 30 kg P2O5 + 25kg K2O +2kg commercial rhizobia / feddan.
T3	50% NPK. + Rhizobia + Microben	16.5kg N+ 30 kg P2O5 + 25kg K2O +2kg commercial rhizobia + 5L commercial microben / feddan.
T4	50% NPK. + Rhizobia + Homic	16.5kg N+ 30 kg P2O5 + 25kg K2O +2kg commercial rhizobia + 4L commercial homic / feddan.
T5	Compost + Rhizobia + Homic+Microbin	30m^3 commercial compost +2kg commercial rhizobia + 4L commercial homic +5L commercial microben / feddan.
T6	Compost + Rhizobia	30m^3 commercial compost +2kg commercial rhizobia / feddan.
T7	Compost + Rhizobia + Homic	30m^3 commercial compost +2kg commercial rhizobia + 4L commercial homic / feddan.
T8	50% NPK. + Rhizobia + Homic +Microbin	16.5kg N+ 30 kg P2O5 + 25kg K2O +2kg commercial rhizobia + 4L commercial homic +5L commercial microben / feddan.

All commercial fertilizers are Brought from agriculture research center, EL-Giza – Egypt.

Analysis of data: Results were expressed as mean ± standard error (SE). The data were analyzed by using **One-way**ANOVA followed by LSD test through SPSS 16 (version 4). The treatments means were compared using least significant difference (LSD) tested at the of probability 5% as described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Seed yield and its components:-

1-Analysis of variance:

Mean square for number of seeds/ ten pods,100-seed weight, seed yield/plant and seed yield/feddan in the two seasons are presented in table 2. Dataindicate that the highly significant were detected for treatments in all yield traits over the two seasons for the tested treatments except for 100-seed weight in 2014. The highly significant of treatments in the two seasons in yield traits is an clear evident about the wide diversity among all treatments in their effects in this traits and this traits means will differed significantly from treatment to another.

Means comparison:

Means comparison for cowpea yield and its components as affected by the eight fertilizer treatments over 2014 and 2015 summer seasons are presented in table 3 and figures1,2, 3 and 4.

For No. of seeds/ ten pods in 2014 the insignificant different were detected in all treatments except the treatment 50%NPK + Rhizobia + Homic + Microbin which gave the lowest value in this trait and differed significantly with all treatments meanwhile the highest value was detected in the two treatments for control flowed by 50%NPK + Rhizobia + Homic in the same season. On the other side, the three treatments Compost + Rhizobia + Homic + Microbin, Compost + Rhizobia and 50%NPK + Rhizobia + Homic expressed the highly significant mean values and differed significantly with other treatments for no. of seeds/10 pods in 2015.

With regard to 100- seed weight the significant were detected for all treatments but the two treatments 50%NPK + Rhizobia + Homic + Microbin and Compost + Rhizobia scored the highly mean values for this trait in 2014 and the treatment50%NPK + Rhizobia + Microbin in 2015.

With respect to seed yield/plant we can detected the highly significant differences among all treatments in the two seasons and we can detected also that the treatment 50%NPK + Rhizobia + Homic + Microbin give the significant mean value among all treatments in 2014. On the other hand, the treatment 50%NPK + Rhizobia + Homic showed the best mean values for seed yield/plant (g) in 2015 among all treatments.

For seed yield / feddan all treatments showed widely diversity in this traits in the two seasons but We can note the continued superiority of treatment 50%NPK + Rhizobia + Homic + Microbin in2014 and the treatment 50%NPK + Rhizobia + Homic in 2015.

In general we can say that the treatment of fertilization 50%NPK + Rhizobia + Homic + Microbin and 50%NPK + Rhizobia + Homic were the best among all treatments where both of them gave an average high-yield and some of its components compared to other treatments in the first and the second season respectively. Soil fertility and productivity are maintained by Soil organic matter. Organic matter acts directly as a source of plant nutrients and indirectly influences the physical and chemical properties. Agricultural practices which involve heavy application of chemical fertilizers may cause depletion of certain nutrients in soil and nutrient disparity which affects the soil productivity. The integration of bio-fertilizers plays most important role in improving soil fertility, yield attributing characters and in that way final yield has been reported by many workers (Kachroo and Razdan, 2006, Son *et al*. 2007 and Venkatashwarlu, 2008). The results are in agreement with those reported by Khaled. (2012) who found that a combined application of organic fertilizers (compost, compost tea, humic acid) or with the different mineral N fertilizer rates markedly increased number of sesame capsules/ plant, seed weight/ plant, seed yield kg/fed., and weight of 1000 seeds (g). The enhancement might be due to the stimulation of growth by directly improving the nutrient availability, or indirectly by promoting the cation exchange capacity of plants (Ingham 2005). Marketable lettuce yield was significantly higher in compost amended plots than those minerals fertilized (Lahoz *et al*., 2009).

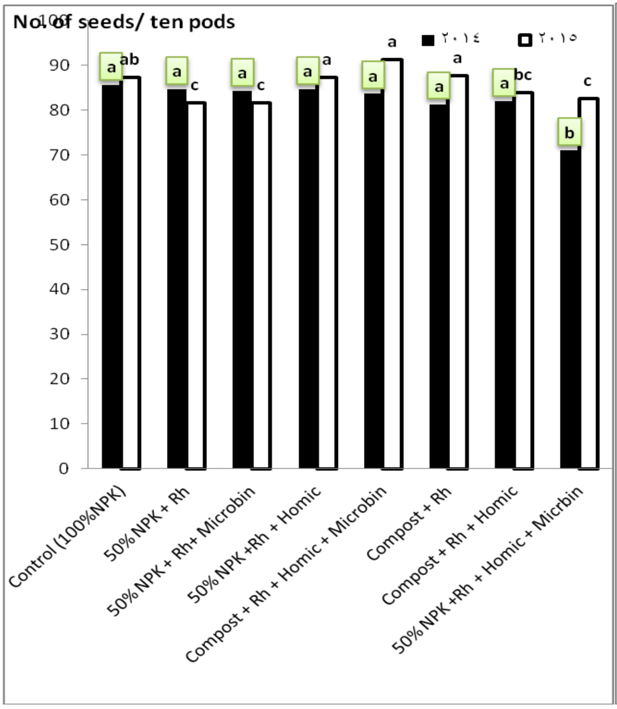

Fig 1: Effects of fertilization treatments in cowpea no. of seed / 10 pods.

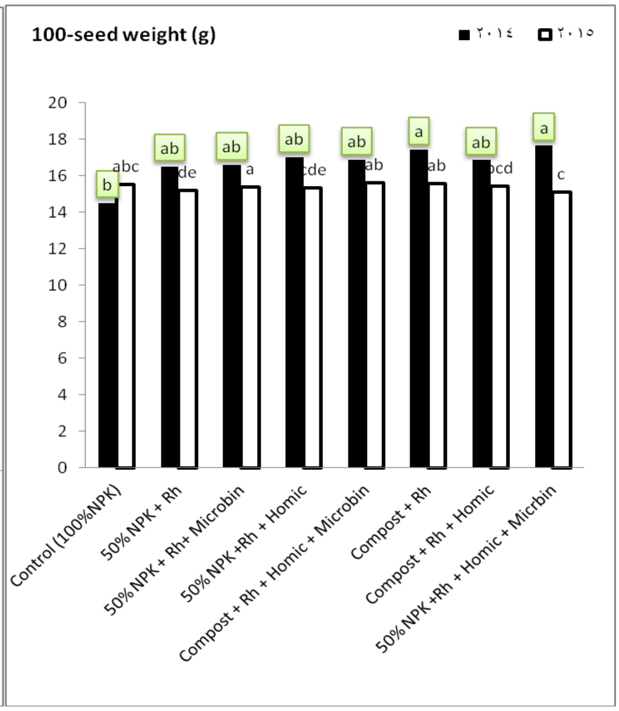

Fig 2: Effects of fertilization treatments in cowpea 100-seed weight (g).

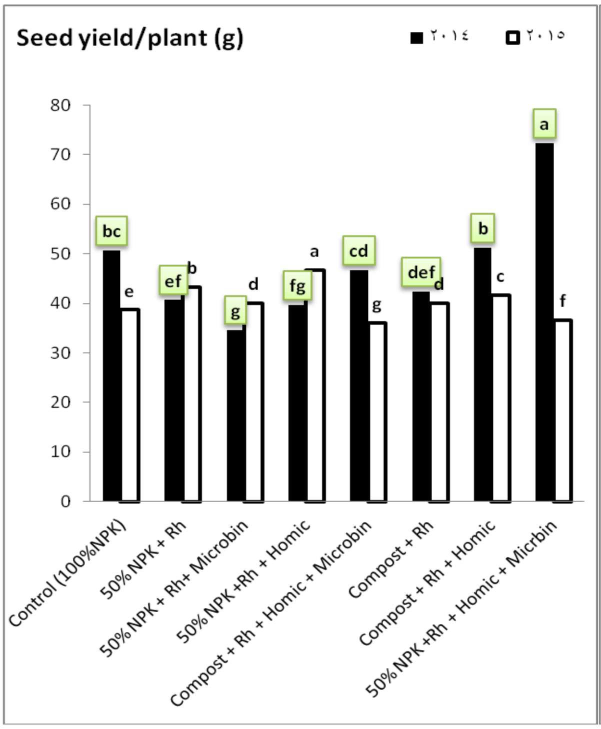

Fig3:Effects of fertilization treatments in cowpea seed yield /plant(g).

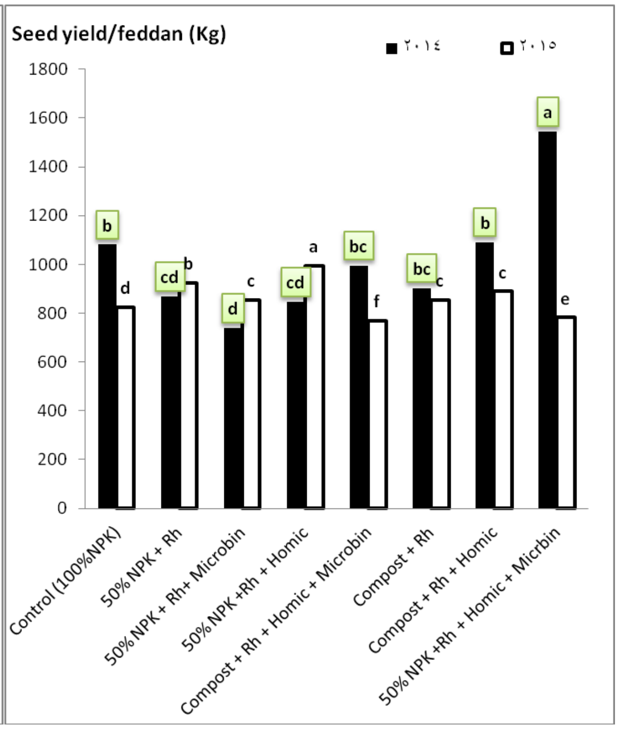

Fig 4: Effects of fertilization treatments in cowpea seed yield /feddan(kg).

Table (2): analysis of variance for seed yield and yield components of cowpea variety Kafr EL-Shaikh in 2014 and 2015 summer seasons.

S.O.V	DF	No. of seeds/ ten pods 2014 MS		No. of seeds/ ten pods 2015 MS		100-seed weight (g) 2014 MS		100-seed weight (g) 2015 MS		Seed yield/plant (g) 2014 MS		Seed yield/plant (g) 2015 MS		Seed yield/feddan (Kg) 2014 MS		Seed yield/feddan (Kg) 2015 MS	
Replications	2	0.792		5.542		1.469		0.017		0.010		0.001		4.741		0.569	
Treatments	7	67.333	**	36.470	**	2.720	ns	0.101	**	402.808	**	36.899	**	183322.413	**	16793.058	**
Error	14	10.744		3.256		2.374		0.018		8.379		0.089		3813.587		40.662	

Table (3): Means comparison for cowpea yield and its components as affected by fertilization treatments over 2014 and 2015 summer seasons

Treatments	No. of seeds/ ten pods 2014 Mean±SE	No. of seeds/ ten pods 2015 Mean±SE	100-seed weight (g) 2014 Mean±SE	100-seed weight (g) 2015 Mean±SE	Seed yield/plant (g) 2014 Mean±SE	Seed yield/plant (g) 2015 Mean±SE	Seed yield/feddan (Kg) 2014 Mean±SE	Seed yield/feddan (Kg) 2015 Mean±SE
Control (100% NPK)	85.667^{a}±2.963	87.333^{ab}±0.333	14.517^{b}± 0.159	15.533^{abc}± 0.098	50.667^{bc}± 1.833	38.667^{e}± 0.033	1080.889^{b}± 39.111	824.889^{e}± 0.711
50% NPK. + Rhizobia	84.667^{a}±2.404	81.667^{c}±1.666	16.513^{ab}± 1.285	15.200^{de}± 0.115	40.667^{ef}± 1.590	43.333^{b}± 0.088	867.556^{cd}± 33.918	924.444^{b}± 1.881
50% NPK. + Rhizobia + Microben	84.333^{a}±0.333	81.667^{c}±0.881	16.583^{ab}± 0.921	15.367^{a}± 0.033	34.667^{g}± 1.764	40.000^{d}± 0.288	739.556^{d}± 37.628	853.333^{d}± 6.158
50%NPK+Rhizobia+ Homic	84.667^{a}±0.667	87.333^{a}±0.333	16.997^{ab}± 1.421	15.333^{cde}± 0.033	39.667^{fg}± 0.882	46.667^{a}± 0.066	846.222^{cd}± 18.814	995.556^{a}± 1.422
Compost+Rhizobia+ Homic+ Microbin	83.667^{a}±1.856	91.333^{a}±0.333	16.867^{ab}± 0.660	15.633^{ab}± 0.060	46.667^{cd}± 3.005	36.000^{g}± 0.288	995.556^{bc}± 64.099	768.000^{f}± 6.158
Compost + Rhizobia	81.333^{a}±1.333	87.667^{a}±0.333	17.413^{a}± 0.958	15.567^{ab}± 0.122	42.333^{def}±0.441	40.000^{d}± 0.000	903.111^{bc}± 9.407	853.333^{d}± 0.000
Compost + Rhizobia + Homic	82.000^{a}±2.000	84.000^{bc}± .309	16.850^{ab}± 0.218	15.433^{bcd}± 0.033	51.167^{b}± 0.726	41.667^{c}± 0.120	1091.556^{b}± 15.498	888.889^{c}± 2.563
50%NPK+Rhizobia + Homic +Microbin	71.000^{b}±1.000	82.667^{c}±0.333	17.643^{a}± 0.293	15.100^{e}± 0.057	72.333^{a}± 0.167	36.667^{f}± 0.120	1543.111^{a} ± 3.556	782.222^{e}± 2.563
LSD 5%	5.784	3.184	2.719	0.239	5.108	0.527	108.962	11.251

Each value is a mean ± S.E (standard Error). Means bearing superscripts in each column are significantly different with each other's at $P < 0.05$.

Relationship between fertilization treatments and the percentage of the rust disease in cowpea:-

1-Analysis of variance:

Mean square for percentage of rust disease at 25and 30th June and at 5 and 12thJuly over all treatments in the two seasons are presented in table 4. The data indicate that the highly significant were detected for treatments in all time measurement over the two season except at 25th June in 2014 season. The highly significant of treatments in the two seasons in rust percentage is an clear evident about the wide diversity among all treatments in their effects at the Susceptibility or tolerance of the cowpea variety to the rust disease.

2-Means comparison:

Means comparison for rust percentage as affected by the eight fertilizer treatments in cowpea variety Kafr EL-Shaikh over 2014 and 2015 summer seasons are presented in table 5 and figures5,6, 7 and 8.

Through the results shown in Table 5 and figures 5, 6, 7 and 8 it is clear that the percentage of injury ranged from 0 to 90% during the two seasons under all treatments with all treatments and during the four measurement periods and were less measurement periods are June 25th in 2015 which given susceptibility percentage of the rust among the eight fertilization treatments and we can detect that the treatment 50%NPK + Rhizobia + Homic + Microbin was the best among all treatments it gave the lowest percentage of injury under the four periods in the two seasons followed by the treatment Compost + Rhizobia + Homic + Microbin and then Compost + Rhizobia or Compost + Rhizobia + Homic in most case.We can detect through the table that the low percentage of infiction has always been linked to the presence of humic acid and in some cases with the compost, on the other hand, the ratio showed high percentage of infection in most cases linked to the existence of chemical fertilizer and sometimes the presence of rhizobia, or both together.

El-Bramawy and Shaban 2010 showed that the potassium soil + foliar applications of fertilizer with increasing the quantity of K+ until level 3 (171.36 + 3.4 Kg K2O/ha) increased significantly the values of the majority of the plant characters and the resistance towards the desired direction.

Sooväli et. al. (2010) . Studied the effects of fertilizers on fungal disease infections and yield of two oat genotypes. The impact of the different levels of fertilization has been noticed at the level of crown rust (induced by *Puccinia coronata*) and oat leaf spot (induced by *Pyrenophora avenae*). Four fertilizer doses (N0 = untreated control N0P0K0 kg ha-1 ; N1 = N60P13K23; N2 = N100P22K39; N3 = N140P31K54) and two variants of chemical treatments (variant 1 – without chemicals; variant 2 – with chemicals as growth regulator, fungicide and with foliar fertilizer) were used. The significant differences in levels of disease infection and grain yields between inputs and varieties were observed. The infection level of both oat diseases was mostly influenced by the yearly weatherconditions. By using variant 2, including fungicide, the infection of *Puccinia coronate* decreased considerably. The fertilizer input increased the grain yield of the oat varieties. Oat grain yields were higher in treated plots in variant 1 than in variant 2, due to weather conditions.

Table (4): analysis of variance for rust disease percentage in cowpea variety Kafr EL-Shaikh in 2014 and 2015 summer seasons over all fertilization treatments.

S.O.V	DF	Rust % 25/6		Rust% 30/6		Rust% 5/7		Rust% 12/7	
		2014	2015	2014	2015	2014	2015	2014	2015
		MS	MS	MS	MS	MS	MS	MS	MS
Replications	2	0.125	0.000	0.125	0.125	0.500	0.031	1.125	0.125
Treatments	7	41.518 **	0.000 -	861.161 **	41.518 **	1402.232 **	62.946 **	1500.000 **	166.071 **
Error	14	0.696	0.000	0.768	0.411	12.500	0.746	9.982	1.839

Table (5): Means comparison for rust percentage as affected by fertilization treatments in cowpea variety Kafr EL-Shaikh over 2014 and 2015 summer seasons.

Treatments	Rust % 25/6		Rust% 30/6		Rust% 5/7		Rust% 12/7	
	2014	2015	2014	2015	2014	2015	2014	2015
	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Control (100% NPK)	10.00^{a}±1.2	0.00 ±0.00	50.0^{a}± 1.15	10.00^{a}± 0.58	70.00^{a}± 2.87	15.00^{a}± 0.59	90.00^{a}± 2.87	25.00^{a}± 0.57
50% NPK. + Rhizobia	5.00^{b}± 0.57	0.00 ±0.00	7.50^{c}± 0.29	5.00^{b}± 0.57	45.00^{bc}± 1.15	10.00^{b}± 0.57	75.00^{b}± 1.15	15.00^{b} ±1.15
50% NPK. + Rhizobia + Microben	0.00^{c}± 0.00	0.00 ±0.00	7.50^{c}± 0.29	5.00^{b}± 0.00	40.00^{c}± 1.15	10.00^{b}± 0.57	50.00^{d}± 1.15	10.00^{c}± 0.57
50% NPK. + Rhizobia + Homic	0.00^{c}± 0.00	0.00 ±0.00	10.00^{b}± 0.57	5.00^{b}± 0.57	50.00^{b}± 2.87	5.00^{c}± 0.00	60.00^{c} ±2.87	10.00^{c}± 0.57
Compost + Rhizobia + Homic + Microbin	0.00^{c}± 0.00	0.00 ±0.00	0.00^{d}± 0.00	0.00^{c}± 0.00	20.00^{e}± 1.15	5.00^{c} ± 0.57	35.00^{e}± 1.15	5.00^{d}± 1.14
Compost + Rhizobia	0.00^{c}± 0.00	0.00 ±0.00	0.00^{d} ± 0.00	0.00^{c} ± 0.00	20.00^{e}± 0.57	5.00^{c}± 0.56	40.00^{e}± 0.57	10.00^{c}± 0.57
Compost + Rhizobia + Homic	0.00^{c}± 0.00	0.00 ±0.00	0.00^{d}± 0.00	0.00^{c}± 0.00	30.00^{d}± 2.87	5.00^{c}± 0.28	50.00^{d}± 1.15	15.00^{b}± 0.57
50% NPK. + Rhizobia + Homic + Microbin	0.00^{c}± 0.00	0.00 ±0.00	0.00^{d}± 0.00	0.00^{c} ± 0.00	0.00^{f} ± 0.00	0.00^{d}± 0.00	20.00^{f} ± 1.15	0.00^{e}± 0.00
LSD 5%	1.472	0.000 (ns)	1.546	1.131	6.238	1.524	5.575	2.393

Each value is a mean ± S.E (standard Error). Means bearing superscripts in each column are significantly different with each other's at P < 0.05.

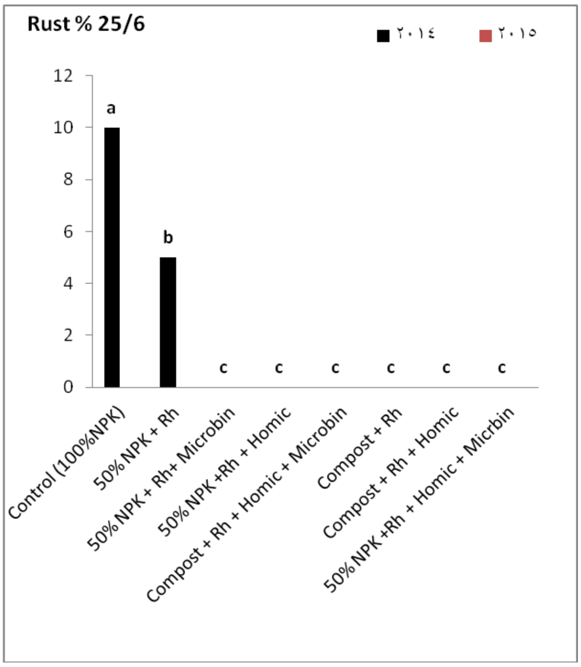

Fig 5: Effects of fertilization treatments rust percentage in cowpea seed yield /plant(g) in 25/6/ 2014 and 2015

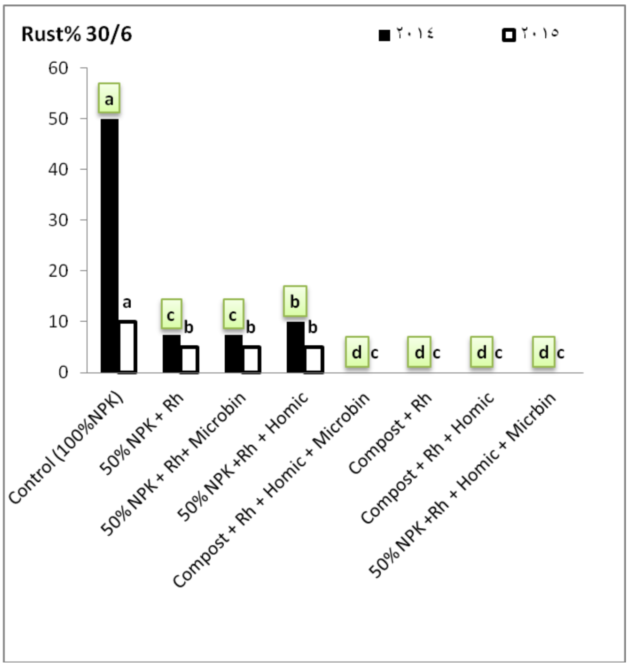

Fig 6: Effects of fertilization treatments rust percentage in cowpea seed yield /plant(g) in 30/6/ 2014 and 2015

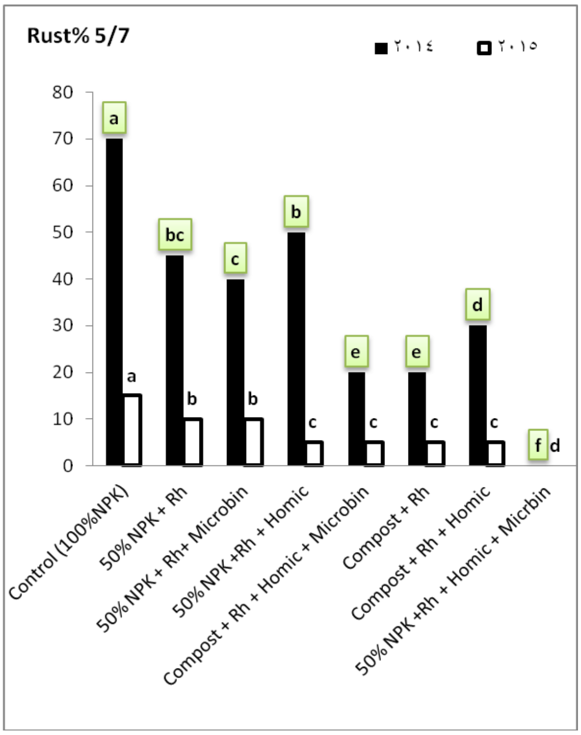

Fig 5: Effects of fertilization treatments rust percentage in cowpea seed yield /plant(g) in 5/7/ 2014 and 2015

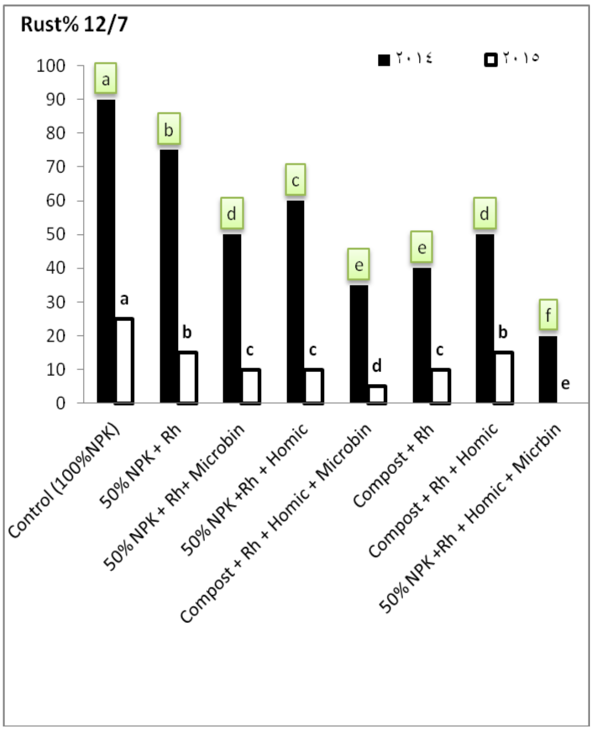

Fig 6: Effects of fertilization treatments rust percentage in cowpea seed yield /plant(g) in 12/7/ 2014 and 2015

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تاثير بعض الاسمدة الكيماوية و العضوية و الحيوية على محصول الحبوب و مكوناته فى صنف اللوبيا كفر الشيخ و علاقتها بالأصابة بمرض الصدأ.

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أجريت هذه الدراسة بالمزرعة البحثية لمعهد بحوث الدراسات البيئية – جامعة مدينة السادات خلال الموسمين الزراعيين ٢٠١٤ و ٢٠١٥ على صنف اللوبيا كفر الشيخ و ذلك بغرض دراسة تاثير بعض الأسمدة الكيماوية و العضوية و الحيوية على محصول الحبوب و مكوناته و كذلك علاقة تلك الأسمدة بنسبة الاصابة بمرض الصدأ حيث تم تقيم ٧ معاملات من الاسمدة الكيماوية و العضوية و الحيوية مع جرعة السماد الكيماوى الموصى بها (الكنترول) فى تجربة صممت فى قطاعات كاملة العشوائية من ثلاث مكررات . تم تقدير نسبة الاصابة بالأصداء على مدار أربعة فترات زمنية فى كل موسم على حدة.تم تقدير محصول الحبوب و مكوناته لكل معاملة.

تم أجراء التحليل الأحصائى للبيانات و كانت اهم النتائج المتحصل عليها كما يلى:

١- تفوق معاملتى التسميد ٥٠% تسميد كيماوى +ريزوبيا + حمض هيوميك + ميكروبين و كذلك ٥٠% تسميد كيماوى+ ريزوبيا + حمض هيوميكعلى كل المعاملات الأخرى فى صفات المحصول و بعض مكوناته فى كلا الموسمين.

٢-لوحظ انخفاض النسبة المئوية للأصابة بالصدأ تحت معاملة التسميد ٥٠% تسميد كيماوى +ريزوبيا + حمض هيوميك + ميكروبين عن باقى المعاملات فى كلا الموسمين فى حين ان نسبة الأصابة بالصدأ شهدت ارتفاعا شديدأ تحت معاملتى التسميد و فى كلا الموسمين.

٣-ارتبط المحصول العالى و انخفاض نسبة الأصابة بالصدأ فى كلا الموسمين بوجود حمض الهيوميك فى معظم المعاملات ووجود الكمبوست فى بعض المعاملات ضمن مكونات السماد فى حين ارتبطت النسبة المئوية المرتفعة للصدأ بوجود السماد الكيماوى فى كل المعاملات او الريزوبيا فى بعض المعاملات او كلاهما ضمن مكونات السماد فى كلا الموسمين.

٤- يمكن التوصية بزراعة صنف اللوبيا كفر الشيخ مع التسميد باستخدام المعاملة رقم ٨

50% NPK. (16.5kg N+ 30 kg P_2O_5 + 25kg K_2O) +2kg commercial rhizobia + 4L commercial homic +5L commercial microben / feddan.

و ذلك للحصول على أعلى وزن لل١٠٠ بذرة و محصول النبات و محصول الفدان و كذلك أقل نسبة من الاصابة بمرض صدأ اللوبيا تحت الظروف الجوية للمنوفية.