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Assessment of Chickpea (*Cicer Arietinum* L.) Growth and Yield Component by Application of Local Granular Organic Fertilizer, Peat and Inorganic Fertilizer: Comparative Study

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Abstract

This study was conducted to increase the productivity of a local variety of chickpea in Kurdistan region by amending and improving Bakrajo soil with locally made granular organic fertilizer (GOF) and peat and also optimizing the rate of inorganic nitrogen fertilizer (INR). The experimental design used in this study was randomized complete block design with three replications. In this study, Bakrajo soil was treated with two types of organic fertilizer with different rates which were granular organic fertilizer (GOF) and peat. The treatment combinations were soil amendment (SA) with three different rates which were (Soil + 0, 4 and 8 % granular organic fertilizer (GOF)(w/w)) and (Soil + 0, 4 and 8 % peat (w/w)).The inorganic N fertilizer used in this study was applied in three different rates (0, 30 and 60 ppm INR) in form of Urea in water) each rate of INR was measured according to the weight of the soil in the pot. Growth characteristic and yield component were determined in this research. The growth characteristics included the height of plant, number of branches, days to 50% flowering (days), days to physiological maturity (days) and yield components were: pods number /plant, seed number/plant, seeds weight/plant (g), hundred seed weight (g) and grain yield (kg/ha. The result showed that the main effect of SA gave maximum plant height, number of branches, number of pods/plant, number of seeds/plant, weight of seeds/plant, hundred seeds weight and grain yield was observed when the plant grown under SA of (Soil + 8% GOF) treatment and application of 60 ppm INR also gave highest value of each of growth characteristic and yield components. While, the combination of SA (Soil+8% GOF) with

30 ppm INR illustrated maximum value of growth characteristic and yield component. The result of this study illustrates that amending soil with 8% of GOF optimize the rate of inorganic N fertilizer.

Keywords: Chickpea, Granular organic fertilizer, peat, growth and yield.

1. INTRODUCTION

Chickpea (*Cicer areitinum* L.) is one of the essential legumes in Kurdistan region of Iraq as a source of food and also as a product which has the potential of sustainable agricultural production in the region. Chickpea also have a considerable role in the improvement of soil productivity by enriching the soil with nitrogen as an essential nutrient for plants. . In terms of microorganisms the bacteria living in nodules on the plant's roots have an ability to transform the environmental nitrogen to the organic form that plants use it during their growth. In addition, Chickpea is one of the valuable crops that provide food of the world expanding population with its nutritious value and its role will become raising essential with the changes that happens in the climates. Chickpea has the third level of production after beans by which its annual production means is over 10 million tons [1]. In India an increases were shown in the field area provided for the chickpea production recently is 13.5 million hectares [2]. In developing countries chickpea plays an important role as a source of protein for these areas that are not able to provide animal source of protein. Due to the importance of chickpea as a source of food, the quality of the chickpea is also important and the quality of a grain enhanced by cultivating the crop under organic agricultural system which is a systems that shown to be able to produce food with high quality standards. The production of crop under the organic system of production will be increased by optimizing the nutrient demand of crop at completing crops different stages. Organic systems of production depend on how the organic content of the system is managed to enhance the soil fertility [3]. The attributes of the soil as a plant growth media, is one of the essential factors that influence the plants growing performance because plant requires sufficient nutrients and moisture from the soil in which they are grown. Another form of organic production of crop is amending the soil with organic fertilizer to improve the physical and chemical characteristic of the soil [4]. In addition, the function of organic fertilizer is to provide support to the plant physically with good root aeration, gas exchange to and from the roots and sufficient water availability for the root towards the other part of the plant [5]. As well as the physical function of soil amendment is to increase the soil aeration which leads the growth of the root, improves the flow of oxygen and nutrients through the soil [6]. Amending soil with organic fertilizer cause mineralization which is a process of decomposition of the chemical compounds in organic matter, by which the nutrients in those compounds are released in soluble forms that may be available to plants [7]. By determination of the chemical characteristic of the soil the required amount of nutrient for the soil can be recognized. One of the soil amendments that internationally used is peat. Peat is known to work as a common soil amendment that will retain more water after its application. Peat is an acid based when it comes to chemical characteristic and can contributes in the production of plants that require a low pH soils. The origin of sphagnum peat goes back to the Canadian and USA bogs that are harvested. The application of organic fertilizer such as granular organic fertilizer (GOF) which is a combination of some important nutrients such as bentonite, humic acid, organic matter and organic phosphorus will have potential to fulfil the plants nutrient needs. The granulated organic fertilizer contains 12% moisture content with bulk density of 0.75 gram per cubic centimeter. The N content of the organic compounds is organic because it contains amino acids cause production of proteins, or the nucleotides that produce the major part of RNA and DNA. The production of local variety of chickpea in Kurdistan region is limited due to its low yield amount as investigated by many researchers in the region. According to study which was

done by [8] the second lowest yield of chickpea was observed in the plot that the local variety seeds were used as compared to the other variety such us Ghab1, Filip1 and Filip 2. In a study which was done by Sulaimany chamber of commerce and industry it has revealed that one of the largest cereal importer company imports 70% of their cereal products from other countries while, only 30% is locally cultivated and chickpea is one of the crops that imported from other countries [9]. Therefore, this study was conducted with the aims of increasing the productivity of local variety of chickpea in Kurdistan region by amending the soil with locally made granular organic fertilizer and peat treatment and also optimizing the rate of inorganic nitrogen fertilizer with final objective of reducing the amount of cereal crops that imported to the region from other countries and increasing region's food security.

2. METHODS AND MATERIALS

The experiment was conducted in the experimental farm of Bakrajo Technical Institute in Sulaimani *(located at 35°32'52.8"N and 45°21'16.6"E)* belongs to Kurdistan region of Iraq**.** The seed was local spring genotype of chickpea (*Cicer areitinum* L.) and were sown on 21st February 2019 followed by rain fall directly after sowing with the humidity of 80%. On 13 March 2019 the germination rate of the seeds were 100%. The plant was harvested on 5th July 2019 (135 days after sowing) to investigate growth, yield and yield component of the spring genotype local variety (Local) of chickpea (*Cic*er areitinum L.). In this study, Bakrajo soil was used andthe total numbers of pots were 81 pots and the size of each pot used was 5 liter with a diameter of 260 mm and height of 340 mm. In this study, Bakrajo soil was treated with two types of organic fertilizer with different rates which were granular organic fertilizer (GOF) and peat and the use of only soil in the pots was the control. The treatment combinations were soil amendment (SA) with three different rates which were (Soil + 0, 4 and 8 % granular organic fertilizer (GOF)(w/w)) and (Soil + 0, 4 and 8 % peat (w/w)).The inorganic N fertilizer (INR) used in this study was applied in three different rates (0, 30 and 60 ppm INR) in form of Urea in water) each rate of INR was measured according to the weight of the soil in the pot. The arrangement of the experiment followed randomized complete block design (Two way-ANOVA-RCBD) with 3 replications. For comparison of the treatments mean, Fisher's Least Significant Differences (LSD) was used when F values were significant at ($P \leq 0.05$). The INR were used in 2 equal doses fifty percentages (50%) was used at sowing and the remaining 50% at vegetative growth period. All of the traits (growth characteristic and yield components) were recorded on 162 plants of chickpea. During the growth period rainfall was sufficient to cover the water needs of the crop and the average rainfall during this period was 5mm per 24 hours in Bakrajo area. The texture of Bakrajo soil is varying from clay soil to silty loam and the chemical characteristic of the soil is showed in Table (1) [10]. The physical and chemical properties of peat have been determined by several researchers and in each gave various results because the properties of this substrate depend on the intensity degree of decomposition. The chemical characteristic of peat is shown in Table (2). The GOF was made locally in Saktan, Erbil, and Kurdistan. The chemical and some physical characteristic of the GOF is observed and shown in Table (3).
The statistical analysis and analysis of variance was determined by Statistical Analysis System (SAS) (release 9.4, SAS Institute Inc., Cary, NC, USA.

Table 1: Chemical Characteristic of Bakrajo Soil

Parameter	**Amount**
pH	7.4
Electrical conductivity(EC) mmhos/cm)	1.7
N (%)	0.24
P (mgkg^{-}1)	3.1

Potassium (K) (mgkg^{-}1)	234.1
Calcium(Ca) (mgkg^{-}1)	4775.8
Mg (mgkg^{-}1)	219.0
Na (mgkg^{-}1)	45.9
Fe (mgkg^{-}1)	8.2
Zn (mgkg^{-}1)	1.0
Cu (mgkg^{-}1)	1.5
Mn (mgkg^{-}1)	32.3
O.M (%)	1.8

Table 2: Chemical Characteristic of Peat

Parameter	**Amount**
Acidity (pH)	6
Total N (mg.l^{-1})	110
P (mg.l^{-1})	125
K (mg.l^{-1})	160

Source: Shamal Organic compost (company)

Table 3: chemical characteristic of Granular Organic Fertilizer

Parameter	**Amount**
pH	6.9
N (%)	5.44
P (%)	4.8
K (%)	5.2
Ca (%)	1.43
Mg(%)	0.47
Na (%)	0.58
Fe (ppm)	3365.5
Zn (ppm)	291.5
Mn (ppm)	453.15
O.M (%)	69.98
B (ppm)	57.98
S (%)	0.75
Humic acid+ Volic acid (%)	15

Source: Shamal Organic compost (company)

2.1 Determination of growth characteristic and yield component traits

The height of the plant and branch number was measured at maturity time. The plant height was measured by a standard ruler and measured as the average of three representative plants from the amended surface of the soil up to the last leaf or pod on the main stem. The number of branches produced by each plant was also counted numerically. In addition, time to flowering from the day of planting to 50% flower appearance was also recorded. The period for the plant to reach its physiological maturity was counted by numerating days from sowing to reach the date that the pod is completely yellow. The pods number per plant was numerated at the maturity stage as; from each treatment three randomly tagged plants and seeds number per pod were numerated. The weight of 100 seeds per plants was recorded and the grain yield per plant was recorded as the seeds weight (average) which was harvested from 3 plants. For calculation of seeds per each pod an average of three pods were taken which was chosen randomly.

3. RESULTS

3.1 Growth Characteristic

The results of analysis of variance (ANOVA) of soil amendment with different organic fertilizer, inorganic N rates and their interaction effects on some growth characteristic of local variety of *chickpea* (*Cicer areitinum* L.) are shown in (Table 4). The main effect of soil amendment (SA) was highly significant for plant height and number of branches and days to physiological maturity and the main effect of (SA) were significant for the growth characteristic of days to 50% flowering. The main effect of inorganic Nitrogen rates (INR) was highly significant for the plant height and number of branches while the same effect was not significant for the days to 50% flowering and days to physiological maturity. The interaction effects of soil amendment (SA) and inorganic nitrogen rate (INR) was significant for plant height and non-significant for other growth characteristics (number of branches, days to 50% flowering and days to physiological maturity). As it is shown in (Table 5) the maximum plant height, number of branches, days to 50% flowering and days to physiological maturity was observed in SA of (Soil+ 8% GOF) which were (37.78 cm, 9.89, 89.85 days and135.85 days) respectively, compared to control (soil+ 0% (GOF)) which were (28.11 cm, 8.56, 74.08 days and 117.74 days) respectively. According to the result of the effect of different INR (Table 6) the maximum plant height, number of branches, days to 50% flowering and days to physiological maturity was recorded under 60 ppm of INR which were (34.23 cm, 9.1, 77.61 days and 122.61 days) respectively in comparison to the control (0 ppm INR) which were (24.5cm, 6.89, 71.88 days and 117.37 days) respectively. The interaction between (SA) and (INR) is illustrated in (Table 7). The highest plant was observed under SA of (Soil + 8% GOF) and application of 30 ppm INR which was (28 cm).The shortest plant was observed in control (Soil + 0% peat) with 0ppm INR which was (21.3 cm). As it's shown in (Table 7) the interaction effect of (Soil + 8% GOF) and application of 30 ppm INR gave maximum number of branches which was (11 branch/plant) NR while, the lowest branch number was observed in control (Soil + 0% peat) with 0ppm INR which was (5.7 branch/plant). The earliest initiation of 50% flowering was observed under SA of (Soil + 4% peat) with 0ppm INR which was (63.2 days).The plant that 50% of its flowering initiation took longest period of (95.6 days) was grown under SA of (Soil + 8% GOF) with 30ppm INR. The plant that needed longer period of time to reach its physiological maturity was also grown under SA of (Soil + 8% GOF) with 30ppm INR. The plants that reached its physiological maturity in a shortest period of time (106.2 days) grown under treatment of (Soil + 4% peat) with 0ppm INR.

Table 4: Analysis of variance (ANOVA) growth characteristic of chickpea (*Cicer areitinum* L.) as influenced by Soil Amendment (SA) and Inorganic N Rates (INR) and their interaction (SA*INR)

S.O.V.	MS				
	DF	**Plant height**	**No. of branches/plant**	**Days to 50% flowering**	**Days to Physiological Maturity**
Block	2	19.08ns	9.24*	364.41ns	155.04ns
SA	5	210.32**	13.88**	810.69*	1046.33**
NR	2	493.87**	25.79**	148.53ns	125.56ns
SA*NR	10	31.75*	0.75ns	71.49ns	127.40ns
Error	34	8.59	1.91	120.98	98.03

*, ** and ns represent significant at $P \leq 0.05$, $P \leq 0.01$ and non-significant, respectively. S.O.V.: Source of Variance, DF: Degree of Freedom and MS: Mean Square

Table 5: *Growth characteristics of chickpea* (*Cicer areitinum* L.) *as influenced by Soil Amendment (SA)*

Soil Amendment (SA)	Plant Height (cm)	No. of branches/plant	Days to 50% flowering	Days to Physiological Maturity
Soil + 0% GOF(control)	28.11	8.56	74.08	117.74
Soil + 4% GOF	33.56	9.22	82.26	130.97
Soil + 8% GOF	37.78	9.89	89.85	135.85
Soil + 0% Peat(control)	24.67	6.56	65.70	108.96
Soil + 4% Peat	26.91	7.22	66.36	112.13
Soil + 8% Peat	31.89	8.00	71.11	115.45
L.S.D. 5%	2.81	1.32	10.55	9.49

Table 6: *Growth characteristics of chickpea* (*Cicer areitinum* L.) *as influenced by Inorganic N Rate (INR)*

Inorganic N Rates (INR) (ppm)	Plant Height (cm)	No. of branches/plant	Days to 50% flowering	Days to Physiological Maturity
0 (ppm)	24.50	6.89	71.88	117.37
30 (ppm)	32.72	8.67	75.19	120.58
60 (ppm)	34.23	9.17	77.61	122.61
L.S.D. 5%	1.99	0.94	7.46	6.71

Table 7: *Growth characteristics of chickpea* (*Cicer areitinum* L.) *as influenced by combination of Soil Amendment (SA) and Inorganic N Rates (NR)* (SA*INR)

Soil Amendment (SA)	Plant Height (cm)			No. of branches/plant			Days to 50% flowering			Days to Physiological Maturity		
	Inorganic N Rates (INR) (ppm)											
	0	**30**	**60**	**0**	**30**	**60**	**0**	**30**	**60**	**0**	**30**	**60**
Soil + 0% GOF(control)	24.7	29	30.7	7.7	8.7	9.3	68.3	73.3	80.6	111.3	116.3	125.6
Soil + 4% GOF	27	34	39.7	8	9.7	10	78.5	82.8	85.4	132.7	128.8	131.4
Soil + 8% GOF	28	45	40.3	8	11	10.7	88.6	95.6	85.4	134.6	141.6	131.4
Soil + 0% Peat(control)	21.3	26	26.7	5.7	6.7	7.3	68.6	63.5	64.9	112.4	106.5	107.9
Soil + 4% Peat	23.7	28	29.1	6	7.7	8	63.2	67.5	68.4	106.2	118.8	111.4
Soil + 8% Peat	22.3	34	39	6	8.3	9.7	64.1	68.4	80.9	107.1	111.4	127.9
L.S.D. 5%	4.86			2.29			18.27			16.44		

3.2 Yield Components

The results of analysis of variance (ANOVA) of soil amendment (SA) with different organic fertilizer, inorganic N rates (INR) and their interaction effects on the yield components of local variety of chickpea (*Cicer areitinum* L.) are shown in (Table 8). The main effect of soil amendment (SA) was significant for pod No./plant, seed No./pod , seed weight/plant (g), hundred seed weight (g) and grain Yield (kg/ha) . The main effect of inorganic Nitrogen rates (INR) was only significant for the seed No./pod while it was not significant for the rest of yield components. The interaction effects of soil amendment (SA) and inorganic nitrogen rate (INR) was significant for seed No. /pod and non-significant for other yield components (pod No./plant, seed weight/plant (g), hundred seed weight (g) and grain Yield (kg/ha)). As it is shown in (Table 9) the maximum pod No./plant, seed No./pod , seed weight/plant (g), hundred seed weight (g) and grain Yield (kg/ha) was observed in SA of (Soil+ 8% GOF) which were (29.78, 1.14, 37.82(g), 39.57(g) and 699.21(kg/ha)) respectively, compared to control (soil+ 0% (GOF)) which were (25.78, 1.00, 31.46(g), 33.20(g) and 588.68(kg/ha)) respectively. According to the result of the effect of different INR (Table 10) the maximum pod No./plant, seed No./pod , seed weight/plant (g), hundred seed weight (g) and grain Yield (kg/ha) was recorded under 60 ppm of INR which were (26.50, 1.09, 32.60 (g), 35.14(g)and 617.50(kg/ha)) respectively in comparison to the control (0 ppm INR) which were (22.89, 1.00, 27.83(g), 30.72(g) and 539 (kg/ha))s) respectively. The interaction between (SA) and (INR) is illustrated in (Table 11). As it's shown in table (11) the maximum pod number per plant was observed under SA of (Soil + 8% GOF) and application of 30 ppm INR which was (33). The minimum number of pods per plant was observed in control (Soil + 0% peat) with 0ppm INR which was (19.7). The maximum seed number per pod was observed SA of (Soil + 8% GOF) and application of 30 ppm INR which was (1.3) compared to the control which was (1). The maximum seed weight per plant (43.8 g), hundred seed weight (45.5 g) and grain yield (803.5 kg/ha) were determined from plants that grow under SA of (Soil + 8% GOF) and application of 30 ppm INR.

The minimum seed weight per plant (24.2 g), hundred seed weight (28.3 g) and grain yield (480.3 kg/ha) were determined from plants that grown under control (Soil + 0% peat) with 0ppm INR.

Table 8: Analysis of variance (ANOVA) Yield component of chickpea (*Cicer areitinum* L.) as influenced by Soil Amendment (SA) and Inorganic N Rates (INR) and their interaction (SA*INR)

S.O.V.	MS					
	DF	**Pod No./plant**	**Seed No./pod**	**Seed weight/plant (g)**	**Hundred seed weight (g)**	**Grain Yield (kg/ha)**
Block	2	85.13*	0.005ns	183.64*	183.44*	55308.60*
SA	5	62.34*	0.031*	207.78*	134.38*	47113.65*
NR	2	34.29ns	0.041*	116.71ns	104.23ns	32505.46ns
SA*NR	10	11.98ns	0.014*	18.03ns	17.77ns	5327.64ns
Error	34	21.32	0.0048	46.06	46.04	13860.54

*, ** and ns represent significant at $P \leq 0.05$, $P \leq 0.01$ and non-significant, respectively. S.O.V.: Source of Variance, DF: Degree of Freedom and MS: Mean Square

Table 9: *Yield Components of chickpea* (*Cicer areitinum* L.) *as influenced by Soil Amendment (SA)*

Soil Amendment (SA)	Pod No./plant	Seed No./pod	Seed weight/plant (g)	Hundred seed weight (g)	Grain Yield (kg/ha)
Soil + 0% GOF(control)	25.78	1.00	31.46	33.20	588.68
Soil + 4% GOF	26.67	1.03	34.21	35.95	636.44
Soil + 8% GOF	29.78	1.14	37.82	39.57	699.21
Soil + 0% Peat(control)	20.22	1.00	24.56	28.60	495.83
Soil + 4% Peat	22.44	1.02	27.40	30.75	536.43
Soil + 8% Peat	24.56	1.10	28.85	32.90	570.37
L.S.D. 5%	4.56	0.07	6.50	6.50	112.79

Table 10: *Yield components of chickpea* (*Cicer areitinum* L.) *as influenced by Inorganic N Rate (INR)*

Inorganic N Rates (INR) (ppm)	Pod No./plant	Seed No./pod	Seed weight/plant (g)	Hundred seed weight (g)	Grain Yield (kg/ha)
0 (ppm)	22.89	1.00	27.83	30.72	539.15
30 (ppm)	25.33	1.06	31.73	34.62	606.84
60 (ppm)	26.50	1.09	32.60	35.14	617.50
L.S.D. 5%	3.32	0.05	4.59	4.60	79.75

Table 11: *Growth characteristics of chickpea* (*Cicer areitinum* L.) *as influenced by combination of Soil Amendment (SA) and Inorganic N Rates (NR)* (SA*INR)

Soil Amendment (SA)	Pod No./plant			Seed No./pod			Seed weight/plant (g)			Hundred seed weight (g)			Grain Yield (kg/ha)		
	Inorganic N Rates (INR) (ppm)														
	0	**30**	**60**	**0**	**30**	**60**	**0**	**30**	**60**	**0**	**30**	**60**	**0**	**30**	**60**
Soil + 0% GOF(control)	23	23.7	24.7	1	1	1	28	32.4	34	29.7	34.1	36	528	605.1	633.1
Soil + 4% GOF	23.3	25	25.7	1	1	1.1	31.9	34.6	36	33.6	36.3	38	596	642.4	671.1
Soil + 8% GOF	24.3	33	26	1	1.3	1.2	33.5	43.8	36	35.2	45.5	38	624	803.5	670.3
Soil + 0% Peat(control)	19.7	20	21	1	1	1	23.7	24.2	26	27.7	28.3	30	480	489.6	517.6
Soil + 4% Peat	20.3	22	22.3	1	1	1.1	24.7	27.4	30	28.8	31.5	32	499	545.5	564.8
Soil + 8% Peat	20.7	22.3	25.7	1	1.1	1.2	25.3	28	33	29.3	32	37	508	554.8	648
L.S.D. 5%	7.89			0.12			11.25			11.25			195.35		

4. DISCUSSION

The results of this research indicate that amending soil with organic fertilizer enhances the morphological characteristic of chickpea. The highest plant was observed when the soil amended with 8% of GOF as a main factor. The same result illustrated from a study which was done by [11] in which the plant height of Tomato increased with application of organic fertilizer. While, as a main factor of INR with increasing the rate of inorganic N fertilizer to 60 ppm highest plant was recorded similar determination was recorded by [12] in which by increasing N rate the height of sunflower increased. This result indicates that application of N inorganic fertilizer was easily absorbed by the plants which could consequently cause rapid growth in the plant. As its shown in the result of this study it's clear that combined application of SA and INR rates reduce or optimize the INR to 30 ppm and gave highest plant compared to control. This result is in line with the result of a study revealed that application of organic fertilizer reduces the amount of N fertilizer when applied to maize crop [13]. The combined application of GOF and INR gave maximum number of branches when applied in percentage of 8%GOF and 30 ppm INR. Similar result reported by a study in which showed that foliar application of N fertilizer in form of Urea had a significant impact on plant height, number of branches [14]. The earliest initiation of 50% flowering was observed under treatment of amending soil with 4% peat and 0ppm of INR and the plant that 50% of its flowering initiation took long period of (95.6 days) was grown under soil amendment of 8% GOF with 30ppm NR. Under this treatment the flowering initiation delayed as in a result of a study which was done by [15] in which with application of N fertilizer the flowering of Rice delayed . The flowering period can directly affect the grain yield. In a research study [16] reported that number of days taken to flowering directly as well as significantly related with the grain yield. early Flowering chickpea produced in higher yields at different location and stresses [17]. It is important to note that the delay in the flowering might be due to the leaf initiation slower rate (i.e. nodes/day) rather than by a change in the flowering mechanism itself [18]. The plant that needed long period to reach its physiological maturity was also grown under treatment which was SA with of 8% GOF with 30ppm INR. The plants that reached its physiological maturity in a short period of time (days) grown under SA of 4% peat and 0ppm of NR. It's clear that with application of inorganic N fertilizer the maturity of the

plant delayed and it may be because of that inorganic nitrogen was promptly accessible which eventually improved the vegetative development which resulted in the maturity delay. This result is in line with a result of a study done by [19] which illustrated that the maturity delayed with expanding the rate of inorganic N. As it is shown in the results of this study amending soil granular organic fertilizer optimizing the N rate to 30ppm and gave highest yield component which were number of pod/plant, number of seed per pod, seed weight/plant, hundred seed weight and grain yield. These may be because of the effect of organic and mineral fertilizer to meet the nutrition requirements of chickpea crop. These results are in line with the result of a study done by [20] which studied effect of organic matter and bio fertilizers on chickpea quality, the results showed that the application of compost at 75 kg ha^{-1} and chemical fertilizer increases grain yield [21] and [22] they recorded that the growth and yield of chickpea significantly raised with application of combination of organic manures and mineral fertilizers. The increase in morphological characteristic and grain yield could be because of the enhancement of the yield components (plant height, number of pods per plant, seed weight per plant and 100 seed weight) consequently [23]. Application of organic fertilizer as a soil amendment reduces the application amount of inorganic fertilizer that causes hazards pollution to the environment. This result prove that organic and bio fertilization can mitigate the pollution of the environment [24] and [25]. It is clear that in this study the highest yield was under application of 30ppm N and this is due to the potential of chickpea to obtain an appropriate amount of (4–85%) of its nitrogen requirement through symbiotic N2 fixation when the plant is grown under organic fertilized soil [26]. one of the obvious result of this study was that the organic fertilizer has a significant effect on the growth and production of chickpea. However, Chickpea is a legume that derives greater nitrogen requirement by its biological N_2 fixation, through Rhizobium inoculants that increase the nitrogen concentration of the fields and thus fertility of the soil [27]. The edaphic environment under organic production system will be more congenial for good crop growth and application of organics regularly maintains it at optimum level. In earlier research work it has been shown that legume yield can be increased under system of organic production [28].

5. CONCLUSION

The growth characteristic and yield component of local variety of chickpea can be enhanced by amending the soil with granular organic fertilizer in a rate of 8% and optimizing the rate of inorganic fertilizer N in a rate of 30ppm. From the results of this study it is clear that amending soil with organic fertilizer could contribute in reducing the used amount of N fertilizer in which the optimum N rate for the highest morphological characteristic and yield component was 30 ppm N rate. It can be concluded that the grain yield of the local variety of chickpea (*Cicer areitinum* L.) can be enhanced by production of the plant under organic amendment of the soil.

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