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Effect of Bio fertilizer and Chemical Fertilizer on Vegetative Growth and Yield of Chick pea (Cicer arietinum L.) in Calcareous Soil

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ABSTRACT

This research was conducted in the field of Bakrajo Technical Institute 2024, in the pot experiment, application of bio fertilizer and chemical fertilizer NPK 20:20:20, the randomized complete design CRD used, the studied of (0.5,1 and 1.5 gL-1) of bio fertilizer, chemical fertilizer NPK 20:20:20 and interactions between them. Results indicated that Significant result was obtained with plant height ,number of pods per plant, weight of pods per plant, 1000 weight seeds(g), harvest index, biological yield, dry matter, also, fresh and dry root weights and no significant with branch number and number of seeds per pods, otherwise, most positive correlation between growth parameters and yield, negative correlation between branch number and number of seeds per pod with other characteristics, low concentration bio fertilizer and active interaction between both fertilizers for yield and vegetative growth increased.

1.Introduction

Many studies examined the impact of biofertilizer on chickpea (Cicer arietinum L.) germination and vegetative growth to enhance crop efficiency and adapt to climate change. To meet the growing demand for plant protein in the food and fodder sector, leguminous crops with high adaptability to adverse environmental conditions can be grown in larger areas and with higher productivity (Yaremko et al., 2024). Also, environment has led to higher average annual temperatures and lower rainfall, affecting plant growth and development (Gabilondo et al., 2023). According to Wangwana and Ogola (2012), chick pea is the third most widely grown crop in the world, behind soya and beans. According to (Ouji et al., 2016), legume seed production accounts for around 20%, or 13.1 million tons on average. Chickpea agriculture is widely distributed due to the plant's tolerance to various agroclimatic conditions. Chickpeas have a strong root system that can overcome mechanical impediments, making them resistant to drought and heat. “In order to maintain the optimal yield level, it is frequently advised to apply inadequate biofertilizer and microorganisms. Also, macro and micronutrient cause a great effect on in chickpea (Choudhary and Rajesh ,2023). According to a different study biofertilizer is a substance that contains live microorganisms that transform nutritional components from unavailable to available form or through biological processes (Vessey, 2003). Biofertilizer treatment have shown positive results in pea. The goal of the current study was to examine response to Chick pea to biofertilizer and chemical fertilizer and interaction between them. Its mean research attempts to assess how chick pea vegetative growth, yield and productivity response to biofertilizer effects, chemical fertilizer effects. Calcareous soils are extensively distributed in arid and semi-arid regions, covering almost one-third of the world's land surface area (Bolan et al., 2023). Based on the findings of this study (Naz et al., 2023) it is advised that farmers using of bio fertilizer on a regular basis under calcareous soil conditions due to considerably increase crop development, yield, and soil physicochemical qualities.

2- Materials and Methods

2.1 Study Area

The experiment was conducted at the Research Farm (Agronomy) of Bakrajo Technical Institute BTI, Sulaimani polytechnic University, Sulaimani City at an altitude of 888 meter above mean sea level and at (N latitude 35.39705 and’ E longitude. 45.28260).

2.2 Growth and Yield Parameters

The experiment consisted of 30 treatment combinations laid on CRD the character plant height (cm), branch number, number of pods plant-1, weight of pods plant-1, number of seeds per pod, biological yield (g plant-1), harvest index (%), root fresh weight g plant-1, root dry weight plant-1, dry matter accumulation per plant (g), (g test weight (g/ 100- seed weight).

2.3 Chick pea Seed and Cultivation

Chick pea seed (Cicer arietinum L.) was sawing after putting in water for 24hr, in pots with 5kg soils volumes with local species type in 26th, march 2024 and harvested in 3rd June 2024 used bio fertilizer liquid (OrganoSul KS, AFEPSA), with pH 4.5 which used (0.5,1 and 1.5 m L-1) and chemical fertilizer NPK 20:20:20 granular type with applied quantity of (0.5,1, and1.5 g. pot-1), Also interaction of (0.5 m. L-1liquid biofertilizer with 0.5 g. pot-1 of chemical fertilizer NPK 20:20:20), 1 m L-1 liquid biofertilizer with 1 g. pot-1 of chemical fertilizer NPK 20:20:20), and 1.5 m L-1 liquid biofertilizer with 1.5 g. pot-1 of chemical fertilizer NPK 20:20:20 for each treatment used three replication and comprised with control used normal irrigation water .

2.4 Soil physical and chemical properties

Soil physiochemical (pH, and EC) were measured in a 1:10 solution (Thomas, 1996). The content of organic carbon (OC) in soil samples was determined using the Walkley-Black method. The percentage of total (CaCO3%) was determined using the scheibiler calsimeter (Loeppert and Suarez (1996). The total content of metals (Ca2+, Mg2+, Na+, K+, and p) in soil samples were determined and recorded in Table (1).

Table 1. Some physical and chemical properties of studied soil.

Parameters	Values
pH	7.3
EC dS m^{-1} at 25 C	0.323
$CaCO_3$ %	26.2
O.M %	2.61
Ca (mg kg^{-1})	4621
Mg (mg kg^{-1})	231
Na (mg kg^{-1})	47
K (mg kg^{-1})	207
P (mg kg^{-1})	3.15
Soil texture type	Silty clay

2.5 Statistical Analysis

The experiment was lay out in complete randomized design with three replications in pot experiment of 5 kg volume. Main plot treatments comprised of three controls, also results analyzed used Excel Stat 2019. Person correlation coefficient was done for parameters.

3. Results and Discussion

3.1 Effect of studied fertilizers on growth parameters and yield of chick pea

The results presented in Table 2 demonstrate the differential responses of chickpea (*Cicer arietinum* L.) growth and productivity to both biofertilizer and chemical fertilizer applications. Significant variations in the studied parameters were observed, with the effects ranked according to their level of significance. The growth and yield parameters exhibited a consistent pattern, indicating comparable responses to both biofertilizers and chemical fertilizers. However, in general, biofertilizer treatment produced more favorable outcomes across the majority of the parameters, suggesting a superior effect compared to the chemical fertilizers. This enhanced response to biofertilizers can be attributed to the activity of microorganisms within the biofertilizer composition, which facilitates improved nutrient availability to the plants. The microbial activity likely enhances soil nutrient cycling and uptake, leading to better plant growth and increased yield. In contrast, the chemical fertilizer treatment, while still beneficial, did not produce as pronounced an effect on plant growth and productivity, highlighting the potential advantages of biofertilizers in sustainable agricultural practices.

Table 2. Summary of the effects of chemical and biofertilizers and their interactions impact on growth and yield of chick pea

Treatments	Plant Height (Cm)	Branch Number	Number of Pods per plant	Weight of pods per plant	Number of Seeds Per pod	Biological Yield(g)	1000 Seeds Weight(g)	Harvest Index	Dry matter	Root Fresh Weight g	Root Dry Weight g
0.5 Interaction B&F	22.67 cd	2.67 a	23.33 a	22.93 a	2.33 a	72.81 a	236.33 abc	0.32 abc	54.61 a	3.59 a	1.73 a
1.5 Interaction B&F	24.67 bc	2.67 a	18.33 bc	19.257 bc	2 ab	60.03 bcd	244.67 a	0.32 abc	45.03 bc	2.26 de	1.08 de
1Biofertilizer	24.33 bc	2.33 a	17 c	19.25bc	2 ab	58.48 cd	239 abc	0.33 ab	40.94 d	2.887 b	1.386 b
1.5 Biofertiliz er	21.33d	2.33 a	20 b	20.19 b	1.67 ab	62.48 b	226bc	0.33 abc	43.74 c	2.01 e	0.96 e
0.5	28a	1.67 a	15 d	18.30 c	1.67 ab	53.62 e	242.67 ab	0.34 a	37.532 e	2.74bc	1.32 bc

Biofertilizer											
1 Inter action B& F	25.3[b]	2 [a]	18 [c]	18.93 [bc]	1.67[ab]	62.12 [bc]	222 [c]	0.31[bcd]	46.60 [b]	2.14 [e]	1.03 [e]
0.5 Chemical Fertilizer	**22.67 cd**	**2[a]**	**17 [c]**	**18.01 [c]**	**2[ab]**	**57.41 [de]**	**223.33 c**	**0.314 abc**	**40.18 [d]**	**2.49 [cd]**	**1.19 [cd]**
1.5 Chemical fertilizer	**23.67 bcd**	**2.67 [a]**	**15 [d]**	**13.11 [e]**	**1.33 [b]**	**54.33 [e]**	**196 [d]**	**0.24 [e]**	**40.75[d]**	**2.72 [bc]**	**1.31 [bc]**
1 Chemical fertilizer	**21.67 [d]**	**2[a]**	**14.33 [d]**	**15 [d]**	**1.67 [ab]**	**53.82 [e]**	**222 [c]**	**0.292 cd**	**38.53 [de]**	**2.54 [cd]**	**1.22 [cd]**
Control	**15 [e]**	**2.67 [a]**	**11.33 [e]**	**11 [f]**	**1.33 [b]**	**39.49 [f]**	**176 [e]**	**0.28 [d]**	**28.83 [f]**	**1.57 [f]**	**0.76 [f]**
Pr > F(Treatment)	**< 0.0001**	**0.520**	**< 0.0001**	**< 0.0001**	**0.304**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
Significant	**Yes**	**No**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

Small letter means Significant level same letters same significant effect (0.5, 1, and 1.5) g weight for both types of Fertilizers

3.2 Effect of bio fertilizer, chemical fertilizer and their interactions on plant height(cm) of Chick Pea

ANOVA tables (2and 3) shows significant analyzed data effects of biofertilizer and chemical fertilizer on plant height(cm) of chick pea, which maximum positive respond results recorded to the application use dosage 0.5 biofertilizer and least square mean 28 and with group of a letter, while minimum plant height dropped down to the application of control and recorded data of plant height 15 cm and e group, The response of the studied parameter to the interaction between biofertilizer and chemical fertilizer application at doses of 1 g and 1.5 g was statistically significant, with the least square means of 25.34 and 24.67, respectively, denoted by the letters "b" and "bc" (Rashidipour et al., 2023). Furthermore, the combined application of biofertilizer at a 1 g dose and chemical fertilizer at a 1.5 g dose, as well as the interaction of biofertilizer (0.5 g dose) with chemical fertilizer (0.5 g dose), resulted in least square means of 24.34, 23.67, and 22.67, with the corresponding letters "bc", "bcd", and "cd". In contrast, the application of chemical fertilizers at doses of 0.5 and 1 g, along with biofertilizer at a 1.5 g dose, produced least square means of 22.67, 21.67, and 21.34, corresponding to the letter's "cd" and "d" (Kumar and Rajesh, 2023). Analysis of variance revealed a sum of squares of 312.54 and a mean square value of 34.73, as shown in Table 2, highlighting the significant effect of biofertilizer application on plant height. This effect is likely attributed to the enhanced microbial activity induced by the biofertilizer, which facilitates greater nutrient uptake. These findings align with previous research by (Lanjewar et al., 2023) and (Jalayerinia et al., 2024), which similarly indicated improved plant growth due to biofertilizer application.

Table 3. The effects of chemical and biofertilizers and their interactions on plant height(cm) of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	312.54	34.73	19.66	< 0.0001
Error	20	35.34	1.77		
Corrected Total	29	347.87			

3.3 Effect of bio fertilizer, chemical fertilizer and interactions on branch number of Chick pea

Tables (2and 4) recorded non-significant of branch number of chick pea to the different applications of biofertilizer and chemical fertilizer however maximum branch number recorded to the interaction of biofertilizer and chemical fertilizer with dose of 0.5 g and least square means 2.67 and group A (Kumar et al., 2023). The analysis of the response to a 0.5 g dose of biofertilizer revealed least squares mean of 1.67 for branch number in Group A (Upadhayaya et al., 2024). The sum of squares was recorded as 3.64, with a corresponding mean square of 0.41, as shown in Table 3. However, no statistically significant differences were observed between treatment groups, consistent with the findings of (Lanjewar et al., 2023), who reported non-significant effects on branch number. This lack of significance may be attributed to the limited mobility of certain essential nutrients from the roots to the shoots, which could hinder branch development throughout the growing season (Choudhary, et al., 2023).

Table 4. The effects of chemical and biofertilizers and their interactions on branch number of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	3.64	0.41	0.93	0.520
Error	20	8.67	0.44		
Corrected Total	29	12.3			

3.4 Effect of bio fertilizer, chemical fertilizer and their interactions on number of pods per plant of Chick pea

ANOVA tables (2 and 5) and figure 1 showed significant results impact of biofertilizer and chemical fertilizer on number of pods per plant of chick pea, when highest number obtained of combined application of biofertilizer and chemical fertilizer 0.5 g dose with least square mean 23.34 and group a while lowest number of pods per plant of chick pea recorded to the control application and least square mean 11.34 with group e (Deepak, and Tejaswin 2023), Also, sum of squares recorded 297.2 and mean squares 33.02 represented from table 4 the results shows agree with study (Dogan and Fatih, 2023). The number of pods per plant increased return to nutrition availability and environmental factors (Meena et al., 2023)

Table 5. The effects of chemical and biofertilizers and their interactions on number of pods per plant of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	297.2	33.02	31.96	< 0.0001
Error	20	20.67	1.03		
Corrected Total	29	317.87			

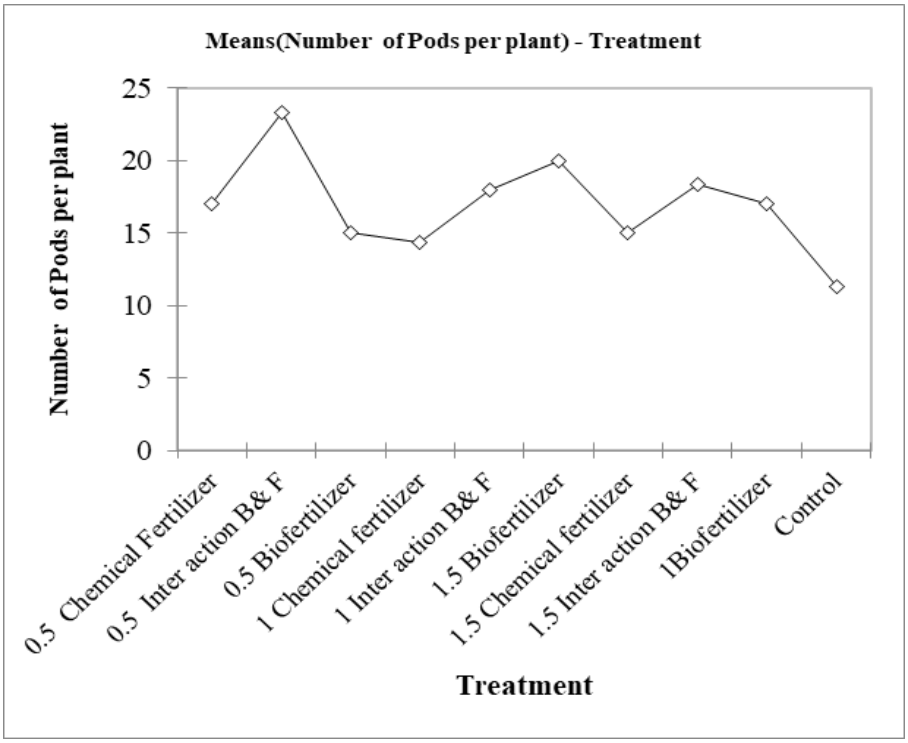

Figure 1. Mean chart effect of effect of bio fertilizer, chemical fertilizer and their interactions on number of pods per plant of chick pea.

3.5 Effect of bio fertilizer, chemical fertilizer and their interactions on weight of pods per plant of chick pea

Data analyzed tables (2 and 6) represented significant results of weight of pods per plant of chick pea which highest value recorded for respond of dosage 0.5 g interaction between biofertilizer and chemical fertilizer with least square mean 22.93 and a letter while lowest data listed for control which used normal water application and least square mean 11, also f group (Deepak, and Tejaswin 2023), when summation of square reported 332.09 and means squares 36.90 which explained from table 5, the results agree with (Minz et al., 2023). The studied parameter significant as a results of increased pod quality due to activity microorganisms and environmental factors.

Table 6. The effects of chemical and biofertilizers and their interactions on weight of pods per plant of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	332.09	36.90	60.29	< 0.0001
Error	20	12.24	0.61		
Corrected Total	29	344.33			

3.6 Effect of bio fertilizer, chemical fertilizer and their interactions on number of seeds per pod of Chick pea

According to the ANOVA tables (2 and 7) which showed responded of biofertilizer and chemical fertilizer effects on number of seeds per pod of chick pea were non-significant analyzed data but maximum results recorded to application of 0.5 g doses with least square means 2.34 and group a while minimum results listed to control which used normal water with Least Square means 1.34 and b group (Mirsardoo et al., 2023), were summation of squares recorded 2.70 and means squares 0.30, therefor results shows agree with

(Rathor et al., 2023). Results Show a non-significant correlation between environmental variables and seed pod nutritional availability

Table 7. The effects of chemical and biofertilizers and their interactions on number of seeds per pod of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	2.70	0.30	1.29	0.304
Error	20	4.67	0.24		
Corrected Total	29	7.37			

3.7 Effect of bio fertilizer, chemical fertilizer and interactions on biological yield(g) of Chick pea

ANOVA Tables (2 and 8) and figure 2 explained significant results data for responded of biological yield or productivity of chick pea to biofertilizer and chemical fertilizer when highest results recorded for interaction of biofertilizer and chemical fertilizer with group a and least square means 72.81 of application 0.5 g doses (Hussain, et al.,2022) while lowest results listed for control with results recorded 39.50 and f group, however summation of squares recorded 1952.46 and means squares 4.34, therefor results shows agree with (Lanjewar, et al., 2023). Its mean reason for increased biological yield due to positive microorganisms and environmental factors.

Table 8. The effects of chemical and biofertilizers and their interactions on biological yield(g) of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	1952.46	216.94	50.01	< 0.0001
Error	20	86.76	4.34		
Corrected Total	29	2039.22			

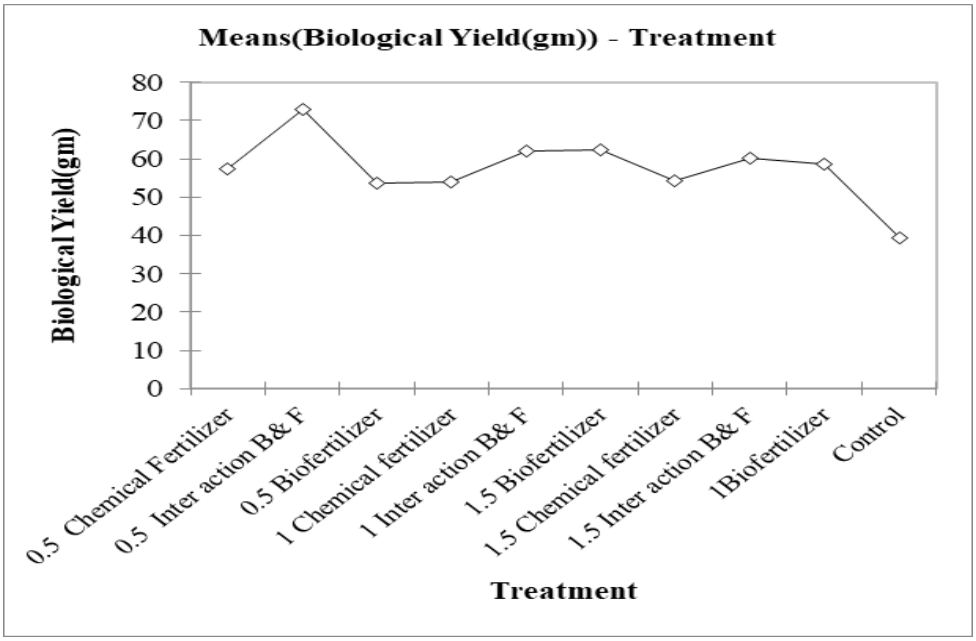

Figure 2. Mean chart effect of bio fertilizer, chemical fertilizer and their interactions on biological yield(g) of chick pea

3.8 Effect of bio fertilizer, chemical fertilizer and their interactions on 1000 seeds weight(g) of Chick pea

Tables (2 and 9) represented significant results data for effect of 1000 seeds weight(g) of chick pea to biofertilizer and chemical fertilizer, maximum results recorded for interaction of biofertilizer and chemical fertilizer with group a and least square means 244.67 of application 1.5 g doses (Taheri, et al.,2022) while lowest results listed for control with results least square means recorded 176 and group e, however summation of squares recorded 12716.14 and means squares 1412.91, Thus, results agree with those of (Lanjewar et al., 2023 and Jalayerinia et al., 2024).When biofertilizer caused increa

sed weight of seed quality and quantity.

Table 9. The effects of chemical and biofertilizers and their interactions on 1000 seeds weight(g) of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	**9**	12716.14	1412.91	16.64	< 0.0001
Error	**20**	1698.67	84.94		
Corrected Total	**29**	14414.80			

3.9 Effect of bio fertilizer, chemical fertilizer and their interactions on harvest index of Chick pea

Tables (2 and 10), and figure 3 represented significant results data for impact of 1000 of harvest index chick pea to biofertilizer and chemical fertilizer, maximum results recorded for interaction of biofertilizer and chemical fertilizer with a group and least square means 0.34 of application 0.5 g doses while minimum results listed for the chemical fertilizer with results least square means 0.24 recorded and group e with doses of 1.5 g application (Koul et al., 2022). however, summation of squares recorded 0.03 and means squares 0.003, the results show agree with (Kumar et al., 2023).

Table 10 The effects of chemical and biofertilizers and their interactions on harvest index of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	0.03	0.003	8.14	< 0.0001
Error	20	0.006	0.00031		
Corrected Total	29	0.03			

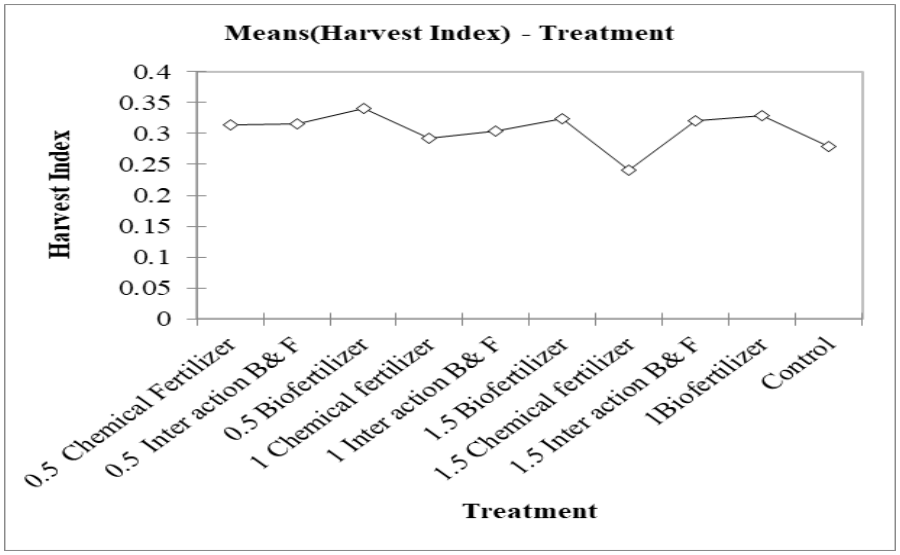

Figure 3. Mean chart effect of bio fertilizer, chemical fertilizer and their interactions on harvest index of chick

3.10 Effect of bio fertilizer, chemical fertilizer and their interactions on dry matter of Chick pea

Tables (2 and 11), and figure 4 represented significant results data for dry matter effects by biofertilizer and chemical fertilizer, when highest value recorded for interaction of biofertilizer and chemical fertilizer with group a and least square means 54.61 of application 0.5 g doses while lowest results listed for the control with least square means 28.84 recorded and group f, (Iqbal, et al., 2023) however summation of squares recorded1207.56 and means squares 134.18, the results shows agree with (Upadhayaya et al., 2024 and Chaechian et al., 2023). The reason of positive significant by increased yield due to improve quality of seeds and nutrition availability.

Table 11. The effects of chemical and biofertilizers and their interactions on dry matter of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	1207.56	134.18	67.741	< 0.0001
Error	20	39.62	1.98		
Corrected Total	29	1247.17			

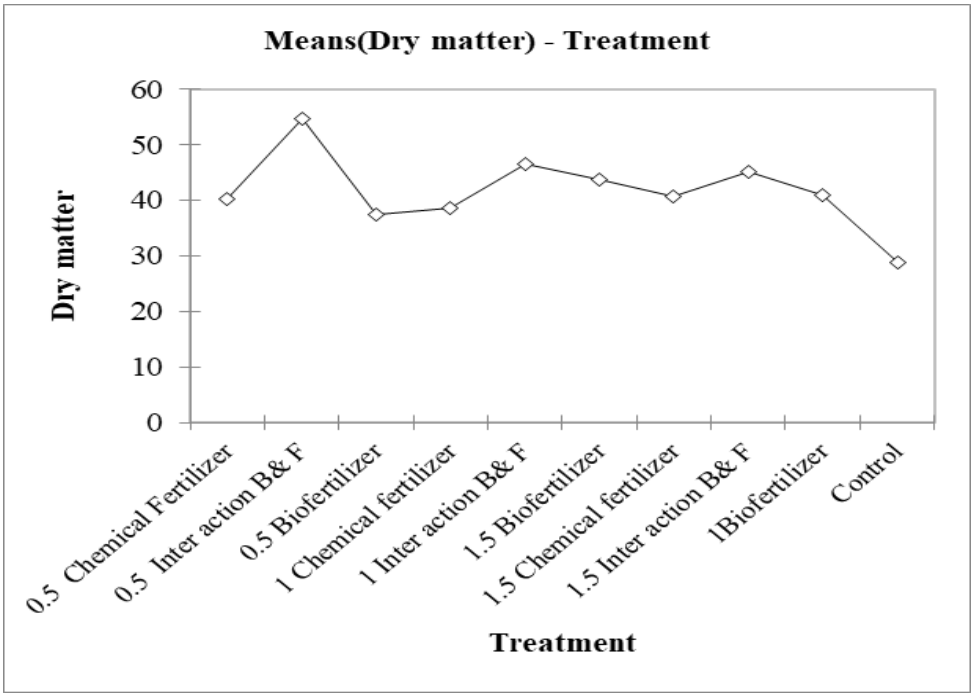

Figure 4. Mean chart effect of bio fertilizer, chemical fertilizer and their interactions on dry matter of chick pea

3. 11 Effect of bio fertilizer, chemical fertilizer and their interactions on root fresh weight(g) of Chick pea

ANOVA tables (2 and 12), reported significant results for root fresh weight(g) of chick pea responded for biofertilizer and chemical fertilizer usage, the maximum value listed for interaction of biofertilizer and chemical fertilizer with group a and least square means 3.59 of application of Interaction bio fertilizer & chemical fertilizer 0.5 g doses(Singh, et al., 2023), while minimum results recorded for the control with least square means 1.58 and group f, however summation of squares recorded 8.19 and means squares 0.91, the results shows agree with (Rashidipour et al., 2023).dry matter significant return to increased weight of biological yield and increased activity of bio organisms activity.

Table 12. The effects of chemical and biofertilizers and their interactions on root fresh weight(g) of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	8.19	0.91	36.07	< 0.0001
Error	20	0.51	0.03		
Corrected Total	29	8.69			

3. 12 Effect of bio fertilizer, chemical fertilizer and their interactions on dry root weight(g) of Chick pea

ANOVA tables (2 and 13), explained significant results for dry root weight(g) of chick pea responded for biofertilizer and chemical fertilizer, the largest weight value listed for interaction of biofertilizer and chemical fertilizer with group a and least square means 1.73 of application of Interaction bio fertilizer & chemical fertilizer 0.5 g doses (Guibin et al.,2022)

) While minimum results recorded for the control with least square means 0.76 and group f, however summation of squares recorded 1.89 and means squares 0.21g the results show agree with (Omer et al.,2021). Due to the effect of activity of organisms caused to increased weight of roots on the other hand neutrinos movement to increase of plant growth and yields.

Table 13. The effects of chemical and biofertilizers and their interactions on dry root weight(g) of chick pea

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	9	1.89	0.21	36.07	< 0.0001
Error	20	0.12	0.006		
Corrected Total	29	2.003			

Table 14 shows the estimated simple correlation coefficient for the 11 characters under examination. Plant height revealed negative nonsignificant results with branch number with value (-0.38), later number of pods per plant results explained positive nonsignificant with plant height and branch number with values of (0.31 and 0.14),(Qulmamatova et al., 2023) next, weight of pods per plant recorded positive significant value with plant height and number of pods per plant recorded correlation coefficient value (0.50 and 0.89) but negative non-significant value with branch number and listed value (-0.09), following number of seeds per pod represented positive significant value with number of pods per plant and weight of pods per plant which represented values(0.53 and 0.55) respectively, also positive non-significant value recorded with plant height and branch number values(0.17 and 0.12), later biological yield(g) recorded positive significant value with plant height, number of pods per plant, weight of pods per plant, and number of seeds per pod recorded values with (0.47, 0.92, 0.88, and 0.41) respectively (Tutlani, et al.,2023). But negative non-significant value with branch number and value (-0.02). Next, 1000 seeds weight(g) recorded positive significant value with plant height, number of pods per plant, weight of pods per plant, number of seeds per pod and biological yield recorded values with (0.65, 0.59, 0.83, 0.41 and 0.61) respectively (Tutlani et al.,2023). however, negative, non- significant value with branch number with value (- 0.17). fowling, harvest index correlation coefficient positive significant with number of pods per plant, weight of pods per plant, number of seeds per pod and 1000 seeds weight(g) values (0.42,0.72,0.42 and 0.79) also positive significant with plant height and biological yield recorded value (0.34 and 0.29) otherwise negative non-significant value with branch number value (-0.18). later, harvest index recorded positive significant with number of pods per plant, weight

of pods per plant, number of seeds per pod and 1000 seeds weight(g)values (0.42, 0.72,0.48 and 0.79), while positive non-significant value with plant height, biological yield g (0.34 and 0.29) also, negative non-significant value with branch number (-0.18) indicates dry matter represented positive significant with plant height number of pods per plant, weight of pods per plant, number of seeds per pod, biological yield, and 1000 seeds weight(g) recorded values (0.44, 0.91, 0.81, 0.40,0.98 and 0.53), but positive non-significant with branch number and harvest index values (0.03 and 0.19), finally both parameters root fresh weight g and dry root weight g represented positive significant with plant height number of pods per plant, weight of pods per plant, number of seeds per pod, biological yield,1000 seeds weight(g) and dry matter values (0.45, 0.52, 0.54, 0.40,0.63, 0.50 and 0.61), while positive non-significant value with branch number and harvest index values (0.01and 0.17) (Paul et al., 2022).

Table 14. Correlation matrix between chick pea growth and yield response to bio fertilizer, chemical fertilizer and their interactions

Variables	Plant Height (Cm)	Branch Numbe r	Number of Pods per plant	Weight of pods per plant	Number of Seeds Per pod	Biological Yield(g)	1000 Seeds Weight(g)	Harve st Index	Dry matter	Root Fresh Weigh t g	Dry Root Weight g
Plant Height (Cm)	**1**										
Branch Numbe r	**-0.38**	**1**									
Number of Pods per plant	0.31	0.14	**1**								
Weight of pods per plant	**0.50**	-0.09	**0.89**	**1**							
Number of Seeds Per pod	0.17	0.12	**0.53**	**0.55**	**1**						
Biological Yield(g)	**0.47**	-0.02	**0.92**	**0.88**	**0.41**	**1**					
1000 Seeds Weight(g)	**0.65**	-0.17	**0.59**	**0.83**	**0.41**	**0.61**	**1**				
Harves t Index	0.34	-0.18	**0.42**	**0.72**	**0.48**	0.29	**0.79**	**1**			
Dry matter	**0.44**	0.03	**0.91**	**0.81**	**0.40**	**0.98**	**0.53**	0.19	**1**		
Root Fresh Weight g	**0.45**	0.01	**0.52**	**0.54**	**0.40**	**0.63**	**0.50**	0.17	**0.61**	**1**	
Dry Root Weight g	**0.45**	0.01	**0.52**	**0.54**	**0.40**	**0.63**	**0.50**	0.17	**0.61**	**1**	**1**

Values in bold are different from 0 with a significance level alpha=0.05

4. Conclusion

The study found that using bio fertilizers chemical fertilizer NPK, and mix or together significantly impacts on chickpeas (*Cicer arietinum* L.), yield, and quality.

The study conclusion showed that increased growth parameters with productivity or yield Are strongly impacted by the use of bio fertilizer and low concentration in addition interaction between both types of fertilizers positive respond.

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