Influence of Seed Size and Nitrogen Levels Application on Nodulation, Yield and Yield Components of Chick Pea.

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Abstract

Pot experiment was conducted to determine the effect of three levels of nitrogen 0, 25, and 35 kg urea $ha^{-1}$and seed size (7, 8, 9 mm) on chick pea component. A factorial experiment consisting of nine treatments in each replication laid out in Randomized Complete Block Design (RCBD) with three replications local variety of chick pea was used, the studied traits were, plant height $(cm)^2$ number of nodule $plant^{-1}$, secondary branches plant dry weight (g), number of pods $plant^{-1}$, 100- seed weight (g) and seed yield plant (g). Result related to the nitrogen levels showed highly significantly of all traits while the seed size exhibited significant effect on all traits except dry weight and number of secondary branches $plant^{-1}$. The highest plant height (36.12 cm), dry weight (23.41g), number of secondary branches (30.77), number of nodule plant (6.57). number of pod $plant^{-1}$(23.17), number of seeds $plant^{-1}$ (23.77), 100 seed weight (22.70_g) and yield $plant^{-1}$ (33.25 g) were obtained from add 25 kg urea ha^{-1}, while the highest values were recorded from large size (9 mm) for all measured parameters. The interaction between nitrogen levels and seed size, the results showed highly significant effect on plant height, number of nodule $plant^{-1}$ and 100- seed weight and non-significant for the rest traits. From this study the nitrogen and seed size played an important role to improve harvest ability by increasing vegetative growth in early growth stage and increase nodules formation percent 59%. Also the results revealed significant and highly significant positive correlation among studied traits and the values ranged between 0.458 number of nodules plant with plant height and 0.964 between plant height and number of seed per $palnt^{-1}$.

Key word: nitrogen, seed size, yield and yield component, nodulation.

Introduction

Chick pea (*Cicer aritinum* L.) is an important pulse crop grown and consumed all over the world. Chick pea is a major food legume in many countries Asia, the Middle East and South and Central America. It is highly nutritious grain legume crop and is one of the cheapest sources of protein. (Siddiaue and Sylex 1997). chick pea also plays a significant role in maintaining soil fertility (Yadav *etal* ., 2007).(Adebisi *etal*., 2011; Jerlin and Vadivelu, 2004) reported that the effect of seed size on germination, ground cover and performance of plant has been confirmed. Seed size is one of the most important characteristics of seed that can effect on the duration of seed development.

Generally big seed with higher amount of initial food reserves germinate early with exhibiting uniformity and grow vigorously in field and show early advantage of plant vigor with respect to plant performance and yield in ability as compared to small and medium seed in several crops. In other study (Adebisi *etal*., 2013) with a study on soybean seed size differences reported that determination of the effects of seed size on yield and yield components of soy bean and other important legumes has highest importance and seed size soybean is influenced by genetic and environment factors.

On the other hand, even if Legume-Rhizobia association fix-N, small amount of nitrogen needs to a variable in the soil which will be used by the plant in this case chick pea for its establishment and growth until thou set of N-fixation (Giller and Cadisch, 1995). Thus, in soil with deficiency, there is needed to apply small dose of fertilizer to legume to overcome the deficiency and harness their growth and this low dose of nitrogen applied externally is called starter dose. In this raged, (Thaku *etal*., 1989) recommended that legume like chick pea requires low of nitrogen which is between 15-20 k ha^{-1}. in nitrogen deficient soils .For the interaction

between seed size and nitrogen levels, (Erdemci *etal*., 2016) reported that the interaction between fertilizer and large seed were sown achieved the maximum value of number pod plant, biological yield, seed weight and seed yield, while the highest plant cm were recorded from fertilizer x medium seed size treatment. Therefore, the present study aimed to assess the effect of seed size and nitrogen levels application on nodulation, yield and yield component of chick pea.

Material and Methods

Soil was collected from 0-30cm from five deferent location of the field experiment station soil at the College of Agriculture University of Duhok, then were composited and processed for soil analysis before sowing. Composite soil sample were analysis for PH (8.2), EC (0.53-ds.m^{-1}), soil texture (clay, loam) and available nitrogen %0.013, pots were filled with 2000 g air-dry soil. Local variety of chick pea was used and seed with100% purity we regarded into three size (small, medium and large) using sieves of 7, 8, and 9 mm apertures diameter. The experimental consist of nine treatments with a factorial combination of three seeds size (7, 8, 9 mm) and with three levels of nitrogen 0,25 and 35 kg urea/ha^{-1}. Randomized Complete Block Design (RCBD) with three replications was used. Seven seeds from each group size were planted in each pot (in 9/4/2018) and water was added in amount sufficient to bring soil water content to75% of soil field capacity. The nitrogen added after 15 days from seed germination (Sexena and Sheldralxe, 1980).

The studied plant traits were, plant height (H), number of nodule $plant^{-1}$ (NNP), number of secondary branches (NSB), dry weight (DW), number of pod $plant^{-1}$ (NPP), number of seed plant (NSP), and seed yield plant (SYP).The analysis of data was statistically by using Minitab software package (16) subsequently. Tukey paiwite comparison for the mean of treatments.

Result and Discussions

Effect of nitrogen levels on nodulation, yield and yield components of chick pea.

The results of analysis variance Table1 showed that the effect of nitrogen levels on PH, DW, NSB, NNP, NPP, NSP, 100 SW and SYP was significant in 1%. Probability levels. The highest PH, (36.12cm), DW (23.41g), NSB (3077), NNP (6.57), NPP (23.17), NSP (23.77), 100 SW (22.70g) and SYP (33.25 g) were obtained from added (N_2) treatment 25.0 kg urea/ha^{-1}, while the lowest values for all traits were recorded in the untreated control treatment Table 2 the result implies that both treatments had stimulating effect on nodulation of chick pea. This sub treated several findings that application of state dose of nitrogen fertilizer to legumes enhances nodulation and nitrogen fixation by symbiotic nitrogen fixing bacteria while, added high dose nitrogen fertilizer can inhibit nodulation and crop nitrogen fixation these results were confirmed by (Erdemci etal., 2016; Gan etal., 2004; Giller and Carisch 1995 and Thaku etal., 1989).

Table 1. Analysis of variance for nitrogen levels and seed size on nodulation, yield and yield, components in chickpea

s.o.v	df	MS								
		Characters								
		PH (cm)	DW g	NSB	NNP	NPP	NSP	100-SW (g)	SY (g)	
Replication	2	1.67	0.36	20.19	0.44	2.43	0.18	0.59	1.54	
Nitrogen level(N)	2	368.81**	231.57**	520.20**	2.8**	229.47**	267.20**	28.61**	278.74**	
Seed size(S)	2	31.02**	5.20	2.26	54.98**	29.17**	19.23*	32.57*	43.44*	
NXS	4	6.82**	0.51	1.10	1.12**	1.21	0.34	1.25**	3.19	
Error	16	1.13	1.54	4.37	0.16	0.61	0.33	0.14	1.14	
Total	26									

***: Significant at level o.o5, ** significant at level 0.01. (PH) plant height cm, (DW) dry weight (g), (NSB)number of branches plant^{-1},(NNP) number of nodules plant^{-1}, (NPP) number of pod plant^{-1}, (NSP) number of seeds plant^{-1}, (SW -100) seed weight (g), (SYP)seed yield plant^{-1}.**

Table2. Effect of nitrogen on nodulation and yield components in chickpea								
Nitrogen level	Characters							
	PH (cm)	DW (g)	NSB	NNP	NPP	NSP	100 - SW (g)	SYP (g)
N_0	23.32 c	13.41 c	15.92 C	5.45 b	13.12 c	12.88 c	19.25 C	22.17 C
N_1	30.10 B	19.86 b	21.57 B	5.86 b	18.95 b	17.95 b	20.31 B	28.61 B
N_2	36.12 A	23.41 a	30.97 a	6.57 a	23.17 a	23.77 a	22.7 A	33.25 A

(PH) plant height cm, (DW) dry weight (g), (NSB) number of branches plant^{-1}, (NNP) number of nodules plant^{-1},(NPP) number of pod plant^{-1},(NSP) number of seeds plant^{-1}, 100 – SW seed weight (g), (SYP) seed yield plant^{-1}.

Effect of seed size on nodulation, yield and yield components of chick pea:

Data presented in Table 1 showed that seed size significantly (>0.01) affected on PH, NNP, NPP, NSB, 100-SW and SYP except NDW, NSB.

The highest values were recorded from large size seed (9mm) for all measured parameters. For PH (31.34cm), DW (19.16g), NSB (23.18), NNP (9.18), NPP (20.24), NSP (19.52), 100-SW (22.61g) and SYP (30.03g). In general the lowest values were obtained at the small size except DW which recorded (19.48 g). Table 3. From these results, the large seeds in many crops play an important role in producing more vigorous plant and may influence the yield or its components.

The most studied in chick pea have been achieved over the world nothing the direct or indirect effect of seed size on yield. These results were in accordance with (Eser etal., 1991, Jackson and Miller 2002, Khalaf etal.,2003, Tawaha, and Turk 2004 and Adebisi etal.,2011).

As regards the interaction between nitrogen levels and seed size, the results in Table-1 showed highly significant effect on PH, NNP and SW and non-significant for DW, NSB, NPP, NSP and SYP. Table 4 indicates that an interaction between N*****S for all studied characters, for PH the highest value was obtained at N_3S_9 treatment which recorded (37.98 cm) and followed by N_2S_8 treatment and recorded 35.67 cm while the lowest value was obtained at NoS_7 and recorded 21.80 cm. Regarding for DW the maximum value which obtained at N_2S_8 while, the minimum DW recorded at NoS_7. In the same table the results showed that the interaction NXS gave the largest value for NSB and recorded 31.50. According to interaction effect between nitrogen levels and seed size on NNP, NPP, NSP, SW and SYP, the interaction N_2S_9 recorded the maximum values (9.18, 24.26, 25.40, 24.83g and 34.60g respectively while lowest value for the same traits exhibited 3.73, 11.53, 11.46, 17.73g and 19.98g sequence. From the results above the nitrogen levels and seed size play an important role to improve harvest ability by increasing plant height and gave good vegetative growth in early growth stage and increase the nodules formation percent 59%, this cases more vigorous growth plant and may influence the direct or indirect of seed yield plant, while the nitrogen deficiency causes a reduction in growth rate. (Namver etal., 2011). These results concur with the observation made by (Amany, 2007 and Caliskan etal., 2008) who reported the nitrogen application effect on chick pea growth.

The results in Table 5 revealed significant and highly significant positive correlation among studied traits except No .of nodule plant^{-1} with dry weight

Table 3. Effect of seed size on nodulation, yield and yield components in chickpea.

	Characters							
Seed size	PH (cm)	DW (g)	NSB	NNP	NPP	NSP	100-SW (g)	SYP (g)
S_7	27.77 B	18.63 a	22.25 A	7.40 b	16.64 C	16.63 C	18.81 c	25.65 c
S_8	30.43 a	19.49 a	23.04 A	8.53 ab	18.37 B	18.46 B	20.87 b	28.35 b
S_9	31.34 a	19.16 a	23.18 a	9.18 a	20.24 A	19.52 A	22.61 a	30.03 a

Number followed by the same letters in the same column are not significance at 0.05 probability level. (PH) plant height cm, (DW) dry weight (g), (NSB) number of branches plant^{-1},(NNP) number of nodules plant^{-1}, (NPP) number of pod plant^{-1}, (NSP) number of seeds plant^{-1}, 100-SW seed weight (g), (SYP) seed yield plant^{-1} (g).

Table 4 Effect of interaction between nitrogen and seed size on nodulation, yield and yield components in chickpea.

NXS	Characters							
	PH	DW (g)	NSB	NNP	NPP	NSP	100- SW (g)	SYP (g)
No S_7	21.80 f	13.03 c	15.95 c	13.73 f	11.53 F	11.46 f	17.73 f	19.98 e
No S_8	25.02 de	13.69 c	15.96 c	5.23 e	12.80 Ef	13.20 E	19.33 de	21.66 e
No S_9	23.16 ef	13.50 c	15.86 c	7.4 bc	15.03 De	14.00 E	20.70 c	24.86 d
N_1 S_7	26.80 d	18.89 b	20.31 bc	2.96 f	16.70 Cd	16.16 D	18.70 ef	25.26 d
N_1 S_8	30.62 c	20.71 ab	21.83 bc	6.10 de	18.74 C	18.53 C	19.93 cd	29.93 c
N_1 S_9	32.88 bc	98.19 b	22.54 b	8.53 ab	21.43 B	19.16 C	22.30 b	30.63 bc
N_2 S_7	34.72 b	22.19 ab	30.50 a	3.60 f	21.70 B	22.26 B	20.00 cd	31.70 abc
N_2 S_8	35.67 ab	24.05 a	31.30 a	6.93 cd	23.56 B	23.66 B	23.36 b	33.46 ab
N_2 S_9	37.98 a	23.99 a	31.13 a	9.18 a	24.26 A	25.40 A	24.83 a	34.60 a

Number followed by the same letters in the same column are not significant difference at 0.05 probability level.

(PH) plant height cm, (DW) dry weight (g), (NSB) number of branches plant^{-1}, (NNP) number of nodules plant^{-1}, (NPP) number of pod plant^{-1}, (NSP) number of seeds plant^{-1}, (100-SW) seed weight (g), (SYP) seed yield plant^{-1}(g).

Table5. Simple correlation coefficient between among studied triats.

	No of seed plant	Dry weight (gm)	Plant high (cm)	Yield plant (g)	No of pods plant	No of branches plant	Wt of loosed (g)
Dry weight (gm)	0.928**						
Plant high (cm)	0.964**	0.931**					
Yield plant (g)	0.959**	0.909**	0.942**				
No. of pods plant	0.966**	0.912**	0.949**	0.96**			
No. of branches plant	0.925**	0.874**	0.903**	0.88**	0.874**		
Wt of loosed gram	0.799**	0.681**	0.785**	0.793**	0.816**	0.672**	
No of nodules plant	0.452	0.299	0.458*	0.535**	0.512	0.278	0.812**

*Correlation significant at level *0.05*
**Correlation significant at level *0.01*

and No. of branches plant^{-1}. Yield exhibited positively correlated with No. of seeds plant, dry weight and plant height with values 0.959, 0.909, and 0.942 respectively. While, the weight of 100 seed recorded highly positive correlation with No. of seed plant^{-1}, dry weight (g), plant height yield plant^{-1}, No. of pod plant^{-1} and, with No. of branches plant^{-1} and the value ranged between o.672 to o.816.

More over positive and significant correlation showed between No. of branches plant^{-1} with No. of seeds plant^{-1} (0.925), dry weight (g) (0.874), plant height (0.903), yield plant (0.880) and No. of pod plant^{-1} (0.874). These results were in harmony with those of (Baksh etal., 2004, Sakipada etal., 2008 and Sokoto etal., 2002). The correlation coefficients of all the inter dependent variable exhibited significant association among themselves. These results concluded that improvement of seed grain in chick pea is linked with these traits. So, it is suggested that these parameters should be an integral part of effective selection criteria to yield enhancement in chick pea.

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