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EFFECT OF NITROGEN FERTILIZER AND IRRIGATION MANAGEMENT ON YIELD OF MUNGBEAN (*VIGNA RADIATA* L.) UNDER CLIMATIC CONDITIONS OF MIDDLE IRAQ

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Abstract

Field experiment was conducted season 2018 at the central Kut nursery of the Kut district in the Wasit Province, Iraq, to evaluate the response of mungbean yield different nitrogen fertilizer and irrigation management planted at basin irrigation method under climatic conditions of middle Iraq. The study carried out in randomized complete block design with three replicates, treatments were used namely: 40 kg N.ha^{-1} as basal with one irrigation at first flowering stage (N_1), 60 kg N.ha^{-1} as basal with one irrigation at first flowering stage (N_2), 80 kg N.ha^{-1} as basal with one irrigation at first flowering stage (N_3) and 100 kg N.ha^{-1} as basal with one irrigation at first flowering stage (N_4). Results showed significant effects on pod length, 100-seed weight, grain yield and biological yield, the highest average was (10.72 cm, 8.55 gm, 1.604 t. ha^{-1} and 2.231 t. ha^{-1}) respectively at treatment N_3. While number of pods per plant was (34.28) at treatment N_2, except number of seeds per pod and harvest index not significant affected.

Key words: Nitrogen levels, irrigation management, seed yield and its components, crop mungbean.

Introduction

The mungbean (*Vigna radiata* L.) is a summer legume that is widely planted in Iraq field, because it has a short growing season (90-120) days and it can bear the drought in all growing phases except for blossoming phase (AL-Shaheen *et al.*, 2016).

Mungbean is one of the worth of crops rich in protein and so agricultural as green manure can be used to strengthen the ground (Azadi *et al.,* 2013).

Mungbean is an important pulse crop having high nutritive value, it not only plays an important role in human diet but also in improving the soil fertility by fixing the atmospheric nitrogen. (Kumar *et al.*, 2012). Legume crops are not only used as human diet but also for improving soil fertility through biological nitrogen fixation. Among the grain legumes, mung bean, commonly known as green gram (Anjum *et al*., 2011). Mungbean relates to leguminaseae family and is generally called as green grain. Nitrogen is the essential component of protein and also plays pivotal role in chlorophyll formation. (Farooq and Bano, 2016).

The efficient fertilizer management is the important factor that greatly affects the growth attributes and yield of this crop. Nitrogen is perhaps the single most important factor limiting the crop yields. (Islam, 2007).

The management of fertilizers is one of the most important factors that greatly affect the growth, development and yield of mung bean. (Bansal and Ahmad, 2015).

Nitrogen is an essential nutrient that needed to grow plants that large amount of it, needed for plant growth that its deficiency in the soil is usually common. Soil mineral fertilizers in agricultural systems are important institutions because the need for food plants resolves in the shortest possible time. (Azadi *et al.*, 2013).

Islam (2007) concluded that mungbean plant has a great demand of nitrogen nutrition during its reproductive development and it is optimized with irrigation.

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Results from field experiment conducted by (Al taai, 2010) to study the effect of N on the yield of mungbean. Results showed that application of nitrogen significantly increased the seed yield.

Rahman (2015) reported that different levels of nitrogen showed significantly increased on grain yield of mungbean.

The objectives of this study were to evaluate the effects of application of optimum nitrogen fertilizer dose and irrigation on yield and its components of mung bean planted in middle Iraq.

Materials and methods

Experimental site

A field experiment was conducted at the central kut nursery, Wasit Agriculture Directorate in the season 2018 under the ecological conditions of the Kut district in the Wasit Province, Iraq. Soil samples were taken with an auger from the soil layers of 0-40 cm to determine selected chemical and physical properties of the experimental field, (Page *et al.*, 1982) the soil texture of the experiment site was clay, pH=7.9, EC=1.6 ds. m^{-1} and the total amounts of nitrogen, phosphorus and potassium were 15, 53 and 189 ppm respectively.

Experimental design and treatments

The experiments were conducted using a randomized complete block design with three replications, the area of each plot was 4 m^2. The treatments were tested as follows: 40 kg nitrogen.ha^{-1} as basal with one irrigation at first flowering stage (N_1), 60 kg nitrogen.ha^{-1} as basal with one irrigation at first flowering stage (N_2), 80 kg nitrogen.ha^{-1} as basal with one irrigation at first flowering stage (N_3) and 100 kg nitrogen.ha^{-1} as basal with one irrigation at first flowering stage (N_4).

Agronomic practices

The mungbean (Pays de production Turkey) was planted between rows 50 cm at 9 April 2018. Urea, Triple Super Phosphate and Muriate of Potash were used as a source of nitrogen, phosphorous and potassium respectively. Nitrogen was applied in the experiment as per treatment. P_2O_5 and K_2O were applied as basal dose at the rate of 75 and 60 kg.ha^{-1} respectively for all the plots.

Plots were irrigated immediately after planting (planting irrigation) at the same time using a basin irrigation method. Irrigation intervals were determined according of plant needs and environmental conditions. While, irrigation treatment was started according to the prescribed irrigation rates.

Weeding was done manually when required to save undue losses of nutrients and soil moisture. The harvest was (during last week of October) random samples of five guarded plants for each experimental unit were taken, the following data were recorded, pod length, number of pods $plant^{-1}$, number of seeds pod^{-1}, 100 grain weight, grain yield, biological yield and harvest index.

Statistical analysis

All collected data in this study were analyzed using GenStat program and mean comparison were carried out by using the least significant difference (LSD) test at probability levels of 0.05.

Results

Data in table 1 indicated the effect of nitrogen levels on the pod length of mungbean. Results illustrated that the highest pod length was (10.72 cm) observed using 80 kg nitrogen.ha^{-1} as basal with one irrigation at first flowering stage. While the lowest was (9.70 cm) obtained with 40 kg nitrogen.ha^{-1} as basal with one irrigation at first flowering stage. These results are in line with (Ghafari and Dass, 2017) and (Yeasmin, 2015). Similar results were also reported by Rahman (2015) recorded highest pod length with higher N rate.

Nitrogen levels affected the number of pod per plant significantly (Table 1). Maximum no. of pod (34.28) was obtained when nitrogen was applied at 60 kg. ha^{-1}. Minimum no. of pod (29.49) at 40 kg. ha^{-1}. Similar result was concluded by (Asaduzzaman, 2015) and (Razzaque *et al.*, 2015). Similar results were noticed by Anjum *et al*., (2006) who stated that application of nitrogen increased the number of pod per plant.

The results showed that the Number of seeds per pod of mungbean was not affected by nitrogen levels. (Table 1).

The results in table 1 showed the effect of nitrogen levels on 100-seeds weight of mungbean crop. Maximum 100 seeds weight (8.55 gm) was obtained when nitrogen was applied at 80 kg. ha^{-1}. Minimum no of seeds per pod

Table 1: Effect of fertilizer nitrogen on the average pod length, No. of pods, no. of seed per pod and 100 seed weight of mungbean during the season 2018.

	100 seed weight (gm)	No. of seed per pod	No. of pods	Pod length (cm)	Treatments
	7.54	9.92	29.49	9.70	N_1
	8.40	10.73	34.28	10.67	N_2
	8.55	10.90	34.07	10.72	N_3
	8.28	10.40	31.60	10.30	N_4
N=	0.698	N.S	2.812	0.731	LSD (0.05)

Table 2: Effect of fertilizer nitrogen on the average seed yield, biological yield and harvest index of mungbean during the season 2018.

	Harvest index	Biological yield (t.ha^{-1})	Seed yield (t. ha^{-1})	Treatments
	66.32	1.796	1.189	N_1
	71.89	2.204	1.578	N_2
	72.15	2.231	1.604	N_3
	67.59	2.022	1.367	N_4
N=	N.S	0.1811	0.2026	LSD (0.05)

(7.54 gm) was obtained at 40 kg. ha^{-1}. Similar findings are reported by (Anjum *et al.*, 2011) and (Jalali *et al.*, 2017). This finding was supported by Rahman (2015) found that application of nitrogen fertilizers resulted increases in seed weight of mungbean.

The results illustrated in (Table 2) indicates significance effects of the nitrogen levels as basal with one irrigation at first flowering stage on the seed yield, N_3 factor gave of the highest average of the seed yield (1.604 t. ha^{-1}) and the factor N_1 which gave the lowest average (1.189 t. ha^{-1}). These results are in agreement with those of (Asaduzzaman, 2015) and (Ghafari and Dass, 2017). Islam (2007) reported that different levels of nitrogen showed significant difference in seed yield of mungbean.

Nitrogen levels affected the biological yield significantly (Table 2). Maximum biological yield (2.231 t. ha^{-1}) was obtained when nitrogen applied at 80 kg. ha^{-1}. Minimum biological yield (1.796 t. ha^{-1}) was observed at 40 kg. ha^{-1}. Similar results have been reported by (Ghafari and Dass, 2017) and (Yeasmin, 2015). Similar results were also by Rahman (2015) reported that application nitrogen fertilizers resulted in appreciable improvement in the biological yield of mungbean. Harvest index of mung bean did not differ significantly by different Nitrogen levels (Table 2).

Discussion

The study was conducted to determine the effect of different nitrogen levels with irrigation management on yield of the basin-irrigated mungbean was planted under the climatic conditions in middle Iraq in 2018.

Above all, the efficient fertilizer management is the important factor that greatly affects the growth attributes and yield of this crop. Nitrogen is perhaps the single most important factor limiting the crop yields. One of the probable reasons for low yield of grain legumes in general is the high requirement of nitrogen for the formation and development of prominent grains (Ghafari and Dass, 2017).

Nitrogen deficiency reduces early vigor and the crop yield reduces accordingly. The nitrogen is most useful for pulse crops because it is a major component of proteins. On the other hand, research studies have revealed that mungbean yield and quality could be improved by the use of balanced fertilizers especially nitrogen. Moreover, there is an exigency to increase the mungbean yield through proper soil fertility management practices especially N (Ghafari and Dass, 2017).

Mungbean like many other crops is sensitive to water availability though it is sensitive to water stress at all growth stages, it is more sensitive to drought at flowering and grain development stage (Islam, 2007).

Mungbean responses favorably to added water resulting in higher yields, especially when irrigation is given at the time of flowering. Irrigation during flowering stage helps for retention of flowers and pod development (Asaduzzaman, 2015).

Conclusion

Based on the results of the present study, it can be concluded that:

1. That nitrogen fertilizer levels did significantly ($p<0.05$) influenced most on the yield attributes of the mungbean.

2. From the results, it may be concluded that mungbean gave maximum production of dry matter, yield attributes and yield when treated with 60 Kg. ha^{-1} and 80 Kg. ha^{-1} as basal and one irrigation at first flower initiation stage.

3. The grain yield and biological yield were significantly and positively affected by fertilizer levels. The highest GY and BY values were obtained with 60 Kg. ha^{-1} and 80 Kg. ha^{-1} as basal and one irrigation at first flower initiation stage, under ecological conditions of middle region, Iraq.

4. This was a one season experimental observation. This trial could be tested for couple of seasons in different environmental condition and different types of soils to achieve better result.

References

Al-Shaheen, M.R., A. Soh and O.H. Ismaaiel (2016). Effect of Irrigation timing and Potassium fertilizing on the some growth characteristics and production for Mungbean (*Vigna radiata* L.). *Int. J. of Sci. and Res. Pub.*, **6(3):** 525-528.

Al taai, D.S.K. (2010). Effect of Nitrogen, Potassium and Iron on Growth, Yield and Yield Components of Mungbean *Vigna radiata* L. Master Thesis College of Agriculture. University of Basrah. Iraqi.

Anjum, M.S., Z.I. Ahmed and C.H.A. Rauf (2011). Effect of Rhizobium Inoculation and Nitrogen Fertilizer on Yield and Yield Components of Mungbean. *Int. J. Agr. Bio*., **8(2):** 238-240.

Asaduzzaman, Md., Md. F. Karim, Md. J. Ullah and M. Hasanuzzaman (2015). Response of Mungbean (*Vigna radiata* L.) To Nitrogen and Irrigation Management. *Am-Euras. J. Sci. Res*., **3(1):** 40-43.

Azadi, E., M. Rafiee and H. Nasrollahi (2013). The effect of different nitrogen levels on seed yield and morphological characteristic of mungbean in the climate condition of Khorramabad. *Ann. of. Bio. Res.*, **4(2):** 51-55.

Bansal, M. and A. Ahmad (2015). Effect of nutrient management on growth, yield and quality of summer mungbean (*vigna radiata* L.). *Int. J. Qua. Sci*., **10(1):** 641-645.

Chattha, M.U., M.U. Hassan, I. Khan, M.B. Chattha, I. Ashraf, W. Ishque, M.U. Farooq, M. Usman and M. Khara (2017). Effect of Different Nitrogen and Phosphorus Fertilizer Levels in Combination with Nitrogen and Phosphorus Solubilizing Inoculants on the Growth and Yield of Mung bean. *Pak. J. life Soc. Sci*., **15(1):** 31-36.

Farooq, U. and A. Bano (2006). Effect of abscisic acid and chlorocholine chloride on nodulation and biochemical content of *vigna radiata* L. under water stress. *Pak. J. Bot*., **38(5):** 1511-1518.

Islam, M.N. (2007). Efficacy of integrated nitrogen and irrigation management on the yield and yield attributes of blackgram. Master Thesis. College of Agriculture. Sher-e-Bangla Agricultural University, Dhaka.

Jalali, M.N.R., A.K. Choudhary, M.Q. Mangle, M.A. Omari, H. Hamayon, S.R. Ghafari and A. Dass (2017). Respons of different nitrogen levels on growth and yield of mungbean (*Vigna radiata* L. Wilczek) in semi-arid region of Kandahar Afghanistan. *Int. J. of App. Res*., **3(10):** 102-106.

Kumar, R., Y.V. Singh, S. Singh, A.M. Latare, P.K. Mishra and Supriya (2012). Effect of phosphorus and sulphur nutrition on yield attributes, yield of mungbean (*Vigna radiata* L. Wilczek). *J. Chem. Pharm. Res*., **4(5):** 2571-2573.

Page, A.L., R.H. Miller and D.R. Keeney (1982). Methods of Soil Analysis. Part 2. Chemical and Microbiological properties, 2nd. ed. Am. Soc. Agron. Inc. publisher, Madison, Wisconsin, USA.

Rahman, F.B.S. (2015). Effect of nitrogen and phosphorus on growth and yield of bari mash-2. Master Thesis. College of Agriculture. Sher-e-Bangla Agricultural University, Dhaka.

Razzaque, M.A., M.M Haque and M.A. Karim (2015). Effect of nitrogen on different genotypes of mungbean as affected by nitrogen level in low fertile soil. *Ban. J. Agr. Res*., **40(4):** 619-628.

Yeasmin, M.I. (2015). Effect of nitrogen and potassium on the growth and yield of bari mashkalai-1(*vigna mungo* L.). Master Thesis. Department of Soil Science. College of Agriculture. Sher-e-Bangla Agricultural University, Dhaka.