

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.912.249>

Effect of Land Configuration and Nutrient Management on Yield and Economics of Greengram under Sodic Soil

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ABSTRACT

Keywords

Greengram, Land configuration, Nutrient management and Foliar spray

Article Info

Accepted:
14 November 2020
Available Online:
10 December 2020

Field experiment was conducted during *kharif* season of 2019 at Anbil Dharmalingam Agriculture College and Research Institute, Trichy to find out the effect of different land configuration and nutrient management on green gram under sodic condition. The experiment was laid out in factorial randomized block design with three replications. The land configuration factor consists of the three treatments *viz.*, flat bed, ridges and furrows and broad bed furrow system. The second factor nutrient management comprising of five treatments like 100% RDF + 1% DAP, 100% RDF + 1% MAP, 75% RDF + 2% MAP, 100% RDF + 1% MKP, 75% RDF + 2% MKP. The results revealed that significantly higher number of pods per plant, number of seeds per plant and yield were recorded under broad bed furrow over farmer's practice of flatbed method. Among the nutrient management practices N₄ - 100% RDF + 1% MKP foliar spray twice at flower initiation and pod formation stage significantly highest growth parameters (pods per plant, number of seeds per plant, 100 seed weight, grain yield and haulm yield) were observed than farmer's practice. Results indicated that broad bed furrow with nutrient management practice of 100% RDF + 1% MKP has the potential to enhance the productivity green gram under sodic condition.

Introduction

Greengram (*Vigna radiata* L.), is a third important pulse crop after chickpea and red gram. It contains 25 per cent protein which is two to three times more than cereals. In Tamil Nadu, the area under greengram is 1.01 L ha, the production of 0.608 L t and productivity of 605 kg ha⁻¹. It is one of the important short duration grain legumes which improve the soil and biodiversity.

Several research workers have notified that land configuration provides better environment for uniform germination, growth, flowering and pod development which eventually increase the yield. Sodic soil having waterlogging problem even for a short period proves detrimental to the crop of greengram particularly during the early growth period to avoid this select suitable land configuration becomes important for successful cultivation of green gram. Raised bed method of sowing has been reported

helpful to reduce the effects of temporary water logging and salt injury on plants (Dhimmar, 2003 and Akbar *et al.*, 2007). The raised bed zone of broad bed and furrow system is provide better aerated with lower penetration resistance and proper crop emergence.

Proper nutrient management is also one of the important factor for sustained production on sodic soil due to their poor fertility status. Sodic soil contain sodium salts which decreases substrate water potential and thus restricts water and nutrient uptake by the roots, high salinity and pH may also cause ionic imbalance and toxicity in plants (Bahadur *et al.*, 2012). Application of plant nutrients through foliar spray resulted in efficient absorption. Keeping this in view, a study was conducted with an objective to find out the suitable land configuration and nutrient management practices in green gram.

Materials and Methods

A field experiment was conducted at Anbil Dharmalingam Agriculture College and Research Institute, Trichy during *kharif* season 2019. The experimental soil was sandy clay loam in texture and alkaline in reaction. Fifteen treatment combinations were tried with three levels of land configuration *viz.*, flat bed, ridges and furrows and broad bed furrow system. Five levels of nutrient management namely farmer's practice of 100 % RDF + 2 % DAP, 100% RDF + 1 % MAP, 75 % RDF + 2 % MAP, 100 % RDF + 1 % MKP, 75 % RDF + 2 % MKP were imposed in Factorial Randomised Block Design with three replications. VBN (Gg) 2 green gram variety was used in the study.

As per the schedule treatments were imposed. The foliar spray solutions of DAP, MKP and MAP were prepared by dissolving 10g and 20 g of fertilizers in one litre of water to get 1%

and 2% concentration, respectively. MKP and MAP fertilizers are highly water soluble salts which completely dissolved in water but DAP granules were dissolved in little quantity of water and allowed to settle overnight and the supernatant solution was taken for spraying after dilution with remaining quantity of water. Yield attributes and yield were recorded in five plants at harvesting stage. Collected data were statistically analysed using ANOVA.

Results and Discussion

Land configuration

The land configuration methods had significant effect on number of number of pods per plant, number of seeds per plant and yield. However it doesn't have no significant effect on test weight *i.e.*, 100 seed weight.

Number of pods per plant was significantly higher under broad bed method of sowing as compared to flatbed method of sowing (Table 1). Similarly among the different land configuration methods, broad bed furrow system significantly recorded the maximum number of seeds per pod. This might be due to improved soil aeration, nutrients availability and better soil environment under broad bed furrow ultimately resulted in better growth and development of green gram crop in sodic condition. In turn this reflected in higher number of pods per plant and number of seeds per pod. The present findings are in agreement with those reported by Rathore *et al.*, (2010), Jadhav *et al.*, (2012) and NICRA, 2014.

Further, higher number of pods per plant under broad bed furrow method of sowing resulted in significantly higher seed yield. Similar trend was also observed for haulm yield of greengram because of higher dry matter accumulation per plant under broad

bed furrow method. This might be due to lower salt injury to plants under broad bed method of sowing as plant root had less chance to revelation with soluble salts which improved soil environment, root development, optimum moisture –air

equilibrium throughout the crop growth period besides easily supply of available nutrients to greengram reflected in higher seed and haulm yields. The results are in accordance with finding of Joshi *et al.*, (2018) and Yadav *et al.*, (2019).

Table.1 Effect of Land configuration and Nutrient Management on yield attributes, yield and economics of green gram

Treatment	Number of pods/plant	Number of seeds / pod	Test weight (g)	Grain yield (Kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Net income (Rs.)	B:C Ratio
Land configuration							
L ₁ - Flat Bed	20.87	9.99	2.9	540.2	1430.2	12511	1.5
L ₂ - Ridges and Furrows	29.42	11.19	3.1	761.3	1794.4	23244	1.8
L ₃ -Broad Bed Furrow	31.6	11.97	3.2	854.6	1952.8	29955	2.0
SEd	0.66	0.24	0.14	20.31	63.54	-	-
C.D(P=0.05)	1.34	0.51	NS	41.61	130.16	-	-
Nutrient management							
N ₁ - 100%RDF + 2 % DAP	28.26	10.94	3.1	730.1	1721.89	22944	1.8
N ₂ - 100%RDF +1 % MAP	29.27	11.49	3.2	792.3	1912.56	26110	1.9
N ₃ - 75 %RDF + 2 % MAP	22.87	9.82	2.7	600.8	1438.33	15207	1.6
N ₄ - 100%RDF +1 % MKP	30.26	12.33	3.3	801.4	1996.22	26794	2.1
N ₅ - 75 %RDF + 2 % MKP	25.83	10.67	2.97	651.7	1560.00	18460	1.7
SEd	0.85	0.31	0.14	26.22	82.03	-	-
C.D(P=0.05)	1.74	0.64	0.28	53.72	168.04	-	-

Nutrient management

Application of 100% RDF + 1 % MKP (N₄) observed significantly higher yield attributes and yield over other treatments. Among the nutrient management, application of 100% RDF + 1 % MKP observed significantly maximum number of pods per plant, seeds per pod and 100 seed weight and it was followed by 100% RDF + 1% MAP as compared to farmer's practice of 100% RDF + 2% DAP. This might be due to the excess application of K as MKP reduce negative effect of sodium salts and also increase uptake of nitrogen which attributed to better growth of plant which resulted in higher production of

photosynthates were utilized by plant for development of sink under adequate supply of nutrients through recommended of fertilizer with foliar application phosphorus fertilizer gave higher number of pods per plant, number of seeds per pod and 100 seed weight under sodic condition. These results are in conformity with those of Himani *et al.*, (2017) and Bulut *et al.*, (2011).

Similarly, seed yield and haulm yield were also recorded significantly higher with application of 100% RDF + 1 % MKP over farmer's practice of 100% RDF + 2% DAP. The higher yield under these treatments might be due to cumulative effect of better yield

attributes (number of pods per plant, seeds per pod and 100 seed weight) and higher nutrient uptake by green gram under sodic condition. The present findings were in accordance with those of Nawange *et al.*, (2011). Similarly Khan *et al.*, (2006) reported foliar application of potassium significantly increased yield

Economic

Economics is therefore most criteria for the farmers while adopting to a new technology. Broad bed furrow method of sowing recorded higher net returns and benefit cost ratio over flatbed method of sowing. Application of 100% RDF + 1 % MKP recorded higher net returns and benefit cost ratio as compared to other treatments. This mainly due to maximum yield and productivity under these treatments leads to the higher net returns and benefit cost ratio. Similar findings were in close vicinity of Choudhary *et al.*, (2013).

The present study concluded that soil sodicity can be overcome with land configuration and nutrient management practices. Sodic soil have a major impact on greengram productivity for sustainable farming system and sodification can also extend into subsoil layers posing serious problems for plant root development and remedial action. On the basis field experiment results, sowing in the broad bed furrow with application of 100% RDF + 1 % MKP as foliar spray may be recommended to enhance the productivity of green gram under sodic soil condition.

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How to cite this article:

Karikalan, N., S. Anandha Krishnaveni, S. Avudaithai and Nithila, S. 2020. Effect of Land Configuration and Nutrient Management on Yield and Economics of Greengram under Sodic Soil. *Int.J.Curr.Microbiol.App.Sci*. 9(12): 2125-2129.
doi: <https://doi.org/10.20546/ijcmas.2020.912.249>