International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979, Impact Factor: RJIF 5.72
www.allsubjectjournal.com
Volume 3; Issue 7; July 2016; Page No. 254-256

Growth and yield of green gram (*Vigina radita* L.) as influenced by bio-fertilizer, tillage practices and weed control methods

Singh PK, Singh SK, Manoj Kumar Shukla, Chanchal Singh, Rohit Singh, Singh SS, Pradeep Prasad

Krishi Vigyan Kendra, Jamui, Bihar, India

Abstract
A farmer's participatory trail was conducted during *Zaid* season of 2011 and 2012 on the farmers' field at Manjosh village in Jamui district (Bihar) to evaluate the effect of bio-fertilizer, tillage practices and weed control methods on growth and yield of green gram. The experiment was laid out in factorial randomized block design using three way ANOVA table. The experiment consisted of two tillage practices (zero tillage and conventional tillage) and herbicide (application and no application) with *Rhizobium* inoculation and un-inoculation. Zero tillage method of sowing recorded maximum plant height, plant dry weight, crop growth rate and relative growth rate during both the years of experiment and in pooled. However, application of Pendimethalin at 1.0 kg ha^{-1} and *Rhizobium* inoculation also recorded the maximum performance of above parameters during both the years of experiment and in pooled. More number of pod $plant^{-1}$, seed pod^{-1}, higher test weight, seed yield, stover yield and harvest index were recorded in zero tillage method of sowing. It further showed that, application of Pendimethalin at 1.0 kg ha^{-1} and *Rhizobium* inoculation also recorded more number of pod $plant^{-1}$, seed pod^{-1}, higher test weight, seed yield, stover yield and harvest index during both the years of experiment and in pooled.

Keywords: Zero tillage, Pendimethalin, *Rhizobium*, green gram, *Vigina radita* L

Introduction

Pulse, the food legume, have been grown since millennian and have been a vital ingredient of the human diet in India. Even "balanced food" as defined over 100 years ago consisted of pulses, besides cereals vegetable, fruits and milk products (Ayachit 2002) [1]. Even today pulse and milk provide the full complement of proteins to people who avoid eating meat (COPR 1981) [3]. Pulses are the second most important groups of crop after cereals. In 2009 the global pulse production was 61.5 million tones ha^{-1} with an average yield of 871 kg ha^{-1}. India is the largest producer and consumer of pulse in the world, accounting for 25 percent of global production, 15 percent consumption, as sizeable population in the country still depends on vegetarian diets to meet its protein requirement. Pre-sowing seed inoculation with bio-fertilizers is a simple and cheap method for increasing pulse production under limited soil moisture. Pre-sowing seed treatment enhances germination, improves vigour and growth of root system, increases drought tolerance, helps in higher nutrient uptake leading to higher economic yield under limited soil moisture.

The Zero tillage method of sowing in India, evolved about 15 years ago (Malik *et. al.*, 2002) [7]. Cereal Systems Initiative for South Asia (CSISA) has been promoting various resource conservation technologies (RCTs) for tillage and crop establishment of rice, wheat and pulses in rice – wheat system. RCTs include Zero Tillage, furrow irrigated raised bed system (FIRBS), laser land leveling, crop residue management, improved method of herbicide application and improved cultivars etc. RCTs have been introduced in the S.E. part of Bihar to reduce the cost of cultivation, save precious resources like water, seed, fertilizer, energy, time, improve the quality of soil resource base and enhance productivity. Zero tillage planting of green gram was found effective in hastening seeding of green gram at least 10-15 days earlier at residual moisture. Zero till seeding of green gram also allowed band application of basal fertilizer which ensure placement of the phosphatic fertilizers right in the seed zone and also allows a saving of 25 % in the seed rate to obtain sufficient plant stand as compared to traditional broadcasting. Keeping the these points in view, an experiment was conducted to find out the effect of bio-fertilizer, tillage practices and weed control methods on growth and yield of green gram.

Material and Methods

The field experiment was carried out on farmer's participatory mode at Manjosh village in Jamui district (Bihar) during *Zaid* season of 2011 and 2012. The experiment was laid out in factorial randomized block design with three replications. The experiment consisted of two tillage practice (zero tillage and conventional tillage) and herbicide (application and no application) with *Rhizobium* inoculation and un-inoculation. Eight treatment combinations *viz.* T_1 - Zero tillage, T_2 - Zero tillage + Pendimethalin at 1.00 kg ha^{-1} as pre emergence, T_3 - Zero tillage + Pendimethalin at 1.00 kg ha^{-1} as pre emergence + Seed inoculation through *Rhizobium* culture, T_4 – Zero tillage + Seed inoculation through *Rhizobium* culture, T_5 - Conventional tillage, T_6 – Conventional tillage + Pendimethalin at 1.00 kg ha^{-1} as pre emergence, T_7 - Conventional Method + Pendimethalin at 1.00 kg ha^{-1} as pre emergence + Seed inoculation through *Rhizobium* culture, and T_8 - Conventional Method + Seed inoculation through *Rhizobium* culture were generated. In zero tillage method the crop was sown through ZT seed drill without any tillage practice at 45 cm row spacing, using seed rate 20 kg ha^{-1} along with pre-plant herbicide glyphosate at 1.00 litre ha^{-1} before 5 days of sowing. Sowing of seeds was done on 10 March and 12 March in 2011 and 2012 respectively. Whereas, in

conventional method the field was ploughed three times and planking was done after each ploughing and then seeds were broadcasted in the field. Pre-emergence herbicide Pendimethalin at 1.00 kg ha^{-1} was applied two days after sowing. The total rainfall recorded during crop growth period was 9.4 and 12.4 mm, minimum temperature range from 12 to 20 ^{0}C and 12.5 to 21^{0}C and maximum temperature 33 to 40^{0}C and 33.5 to 40^{0}C during 2011 and 2012 respectively. Mechanical and chemical analysis of soil was done before experiment to know the initial status of the soil. The soil was sandy loam having 60% sand, 20% silt and 14.4% clay. The soil was clay loam in texture, high in organic carbon (0.72 %), available N (258 kg ha^{-1}), P_2O_5 (20.38 kg ha^{-1}), K_2O (153.6 kg ha^{-1}) content with pH 6.5. Green gram variety SML-668 was used as test crop. The crop was raised with recommended agronomic practices and harvested in two picking within the last week of May. The observations were recorded for various vegetative traits of green gram crop.

Results and Discussion

Effect on growth and growth attributes

Tillage practices significantly affected the various growth parameter of green gram crop. Zero tillage exhibited maximum plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate during both the years of experiment and in pooled. Similar result was also reported by Meena *et al.* (2015) [8] Behera and Sharma (2011) [2]. In zero tillage method seed and fertilizer both was placed together and once dormancy of seeds was broken the seeds got the fertilizer at right time resulting into vigorous plant growth and achieved higher plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate. Weed control methods such as herbicides exerted significant influence on growth parameters of green gram. Maximum plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate was recorded by Pendimethalin at 1.00 kg ha^{-1} as pre emergence during both the years of experiment and in pooled. Similar finding was reported by Das *et al.* (1997) [4]. The lower crop weed competition in herbicide treated plots provided weed free environment and allowed the crop to grow to its potential thereby, increase in plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate. *Rhizobium* inoculation recorded significant maximum plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate during both the years of experiment and in pooled. Similar result was also reported by Thakur and Pawar (1995). Jayakumara *et al.* (1997) [5] reported that *Rhizobium* inoculation increased both root and shoot length and gave maximum performance of growth parameters. Interaction effect of bio-fertilizer, tillage practices and weed control methods was unchanged with growth parameters of green gram.

Yield and yield attributes

Zero tillage method of sowing significantly increased the number of pods $plant^{-1}$, number of seed pod^{-1}, test weight, seed yield, stover yield and harvest index. Similar finding was also reported by Meena *et al.* (2015) [8] Behera and Sharma (2011) [2] Mandal *et al.*, (2002). This might be due to better establishment of crop plant as the result of less weed competition under zero tillage method of sowing. Less weed competition provides better nutrient availability to crop plants resulting in higher yield and yield attributes. Application of Pendimethalin at 1.00 kg ha^{-1} as pre emergence significantly increased number of pods $plant^{-1}$, number of seed pod^{-1}, test weight, seed yield, stover yield and harvest index (Kundu *et al.* 2009) [6]. The favorable reason was the better weed control efficiency by herbicide which provides less crop weed competition and gave maximum nutrient availability. *Rhizobium* inoculation exerted significant influence and gave maximum number of pods $plant^{-1}$, number of seed pod^{-1}, test weight, seed yield, stover yield and harvest index. Singh and Pareek, (2003) [9] reported that biofertilizer like *Rhizobium* significantly increased test weight, seed yield, stover yield and entire yield attributes. This might be due to the greater availability of nitrogen and phosphorus to plant resulting in an increase in number of pods $plant^{-1}$, number of seed pod^{-1}, test weight, seed yield and stover yield. Interaction effect on yield attributes and yield of green gram by bio-fertilizer, tillage practices and weed control methods did not exerted any significant difference.

Conclusion

It can be concluded that zero tillage was the most suitable method for green gram sowing which gave maximum seed yield and stover yield. Application of herbicide Pendimethalin at 1.0 kg ha^{-1} as pre emergence was most effective and superior no application of herbicides for controlling of weeds and achieving maximum seed and stover yield. *Rhizobium* inoculation in green gram significantly increase seed yield and stover yield and it's all should be recommended for green gram production in *Zaid* season.

Table 1: Effect of tillage practices herbicides and *Rhizobium* culture on growth attributes of green gram (pooled data over two year mean)

Treatments		Plant height (cm)	Dry weight (g)	C.G.R (g m^{-2} day^{-1})	R.G.R (g g^{-1} day^{-1})
	Tillage Practices				
T_1	Zero tillage (ZT)	49.09	9.37	5.43	0.014
T_2	Conventional Tillage (CT)	45.49	8.11	4.99	0.011
	F-test	S	S	S	S
	S.Ed. (±)	1.09	0.37	0.35	0.002
	C.D. at 5%	3.22	1.11	1.05	0.007
	Herbicide application				
H_1	No herbicide	46.13	8.35	4.37	0.010
H_2	Pendimethalin at 1.0 kg ha^{-1} as pre emergence	48.46	9.13	5.12	0.013
	F-test	S	S	S	S
	S.Ed. (±)	0.49	0.21	0.12	0.0006
	C.D. at 5%	1.47	0.65	0.36	0.0020

	Rhizobium				
R_1	No *Rhizobium*	46.30	8.50	4.68	0.010
R_2	*Rhizobium* inoculation	48.29	8.99	5.32	0.012
	F-test	S	S	S	S
	S.Ed. (±)	0.41	0.06	0.11	0.0003
	C.D. at 5%	1.23	0.19	0.33	0.0010

Table 2: Effect of tillage practices herbicides and *Rhizobium* culture on yield attributes and yield of green gram (pooled data over two year mean)

Treatments		No. of pods Plant^{-1}	No. of seeds pod^{-1}	Test weight (g)	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index %
	Tillage Practices						
T_1	Zero tillage (ZT)	10.24	9.69	46.46	760.02	2273.14	25.06
T_2	Conventional Tillage (CT)	8.59	8.77	45.93	647.12	2051.12	23.92
	F-test	S	S	S	S	S	S
	S.Ed. (±)	0.54	0.26	0.14	36.03	60.12	0.32
	C.D. at 5%	1.62	0.78	0.42	109.07	182.18	0.98
	Herbicide						
H_1	No herbicide	9.32	9.13	46.06	663.12	2069.44	24.20
H_2	Pendimethalin at 1.0 kg ha^{-1} as pre emergence	9.51	9.33	46.32	744.11	2255.15	24.77
	F-test	S	S	S	S	S	S
	S.Ed. (±)	0.04	0.05	0.06	30.42	36.14	0.15
	C.D. at 5%	0.12	0.16	0.18	92.21	109.42	0.46
	Rhizobium						
R_1	No *Rhizobium*	9.27	9.10	46.00	650.12	2049.22	24.02
R_2	*Rhizobium* inoculation	9.56	9.32	46.38	757.24	2276.57	24.95
	F-test	S	S	S	S	S	S
	S.Ed. (±)	0.07	0.06	0.07	30.11	54.21	0.19
	C.D. at 5%	0.22	0.18	0.23	91.19	162.57	0.59

Reference

1. Ayachit SM. Kashyapiyakrishisukti (A Treatise on Agriculture by Kashyapa). Agri-History Bulletin No.4, Asian Agri-History Foundation, Secunderabad, 2002, 158.
2. Bahera UK, Sharma AR. Effect of conservation tillage and performance of green gram-mustard-cowpea cropping system. Soil and Water Conservation, 2011; 10(3):233-236.
3. COPR. Pest control in tropical grain legumes 1st edition, Centre for Overseas Pest Reserch, Crown publisher, 1981.
4. Das NR, Bhattacharya, SP, Das AK. Weeds in crops of West Bengal in summer season. The World Weeds, 1997; 4:198.
5. Jayakumara M, Eyini M, Velmuragan R. Effect of seed Rhizobium pellecting treatment and addition of coir-pith compost to soil on growth and nodulation of black gram (Phaeseolus mung). Indian Journal of Agriculture science, 1997; 67(12):601-603.
6. Kundu R, Bera PS, Bramachari K. Effect of different weed management practices in summer mung bean under new alluvial zone of West Bengal. Journal of crops and weeds, 2009; 5:117-121.
7. Malik RK, Yadav A, Singh S, Malik RS, Balyan RS, Banga RS, *et al*. Herbicide resistance management and evaluation of zero- tillage – a success story. CCSHAU, Research Bulletin, 2002, 43.
8. Meena JR, Umakant K, Bahera UK, Chakrabarty D, Sharma AR. Tillage and residue management effect of soil properties, crop performance and energy rotation in green gram (vigna radiata) under maize based cropping system. Int. Soil Water Conservation Res. 2015; 3:261-272.
9. Singh B, Pareek RG. Effect of phosphorus and biofertilizers on growth and yield of mung bean. Indian Journal of pulses Research. 2003; 16(1):31-33.
10. Thakur AK, Panwar JDB.) Effect of Rhizobium on growth and yield of mung bean (Vigna radiate L. Wilezek) under field conditions. Indian Journal of plant physiology. 1995; 38(1):62-65.

3 & 7- Ph. D. Scholar, Department of Agronomy, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, U.P.
1- SMS (Agronomy), KVK, Jamui, (Bihar)
2- Head and Senior Scientist, KVK, Jamui, (Bihar)
4- SMS (Plant Pathology), KVK, Jamui, (Bihar)
5- Farm Manager, KVK, Jamui, (Bihar)
6- Head, Division of Crop Research, IIPR, Kanpur (U.P.)