The Pharma Innovation Journal 2023; 12(5): 4699-4703

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(5): 4699-4703

www.thepharmajournal.com
Received: 01-02-2023
Accepted: 06-03-2023

Vikram Bharati
Assistant Professor-cum- Scientist, Department of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Kumar N Lamani
Research Scholar, Department of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

RS Singh
Assistant Professor-cum- Scientist, Department of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

SS Prasad
Assistant Professor-cum- Scientist, Department of Soil Science, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Amrendra Kumar
Assistant Professor-cum- Scientist, Department of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

DK Dwivedi
Associate Professor-cum- Scientist, Department of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

CS Choudhary
Assistant Professor-cum- Scientist, Department of Plant Pathology, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Harendra Singh
Professor-cum-Chief Scientist, Department of Agronomy, Dr. Rajendra Professor-cum-Chief Scientist, Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Corresponding Author:
Vikram Bharati
Assistant Professor-cum- Scientist, Department of Agronomy, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Effect of crop geometry and nutrient levels on growth, yield and economics of soybean (*Glycine max* L.)

Vikram Bharati, Kumar N Lamani, RS Singh, SS Prasad, Amrendra Kumar, DK Dwivedi, CS Choudhary and Harendra Singh

Abstract

A field experiment entitled "The effect of crop geometry and nutrient levels on growth and yield of soybean (*Glycine max* L.)" Was carried out during *Kharif* season of 2019 at Research Farm of Tirhut College of Agriculture, Dholi, RPCAU, Pusa, Bihar, India. The experiment was laid out in factorial randomized block design with three replications. Treatments comprised two parameters *viz.*, crop geometry including 30 x10 cm, 45 x5 cm, 45 x 10 cm and 45 x 15 cm with fertilizer levels including 100% RDF, 120% RDF, and 140% RDF. The soil of the experimental plot was calcareous in nature having pH 8.32 and EC is 0.29dSm^{-1}. It was moderately fertile being medium in organic carbon (0.53%), available nitrogen (112.90 kg ha^{-1}), phosphorus (36.34 kg ha^{-1}), potassium (116.48 kg ha^{-1}) and sulphur (29.9 kg ha^{-1}).

The investigation revealed that crop geometry and nutrient level treatments significantly influenced growth parameters, yield attributes and yield of soybean, *viz.*, Plant height (cm), Plant dry weight (g $plant^{-1}$), number of pods per plant, Number of seeds per pod, 100 seed weight (g), seed yield (q ha^{-1}), straw yield (q ha^{-1})and harvest index (%).

Among the crop geometry treatments, (45 x 5 cm) recorded higher plant height, number of pod per plant, higher plant dry weight, maximum harvest index, number of seeds per pod with maximum seed yield (21.19 q ha^{-1}) and straw yield (26.30 q ha^{-1}) which was significantly superior over others while the lowest seed yield (17.84 q ha^{-1}) was obtained in the treatment of (45 x 15 cm), crop geometry (45 x 10 cm) registered maximum test weight. The highest Net returns (48911 ₹ ha^{-1}) was obtained in the treatment (45 x 5 cm) and lowest (39692₹ha^{-1}) in the treatment of (45 x 15 cm). The highest B: C ratio (1.41) was fetched in the treatment (45 x 5 cm) and (1.24) was in the treatment of (45 x 10 cm).

Among the nutrient level treatments, 140% RDF (NPK) recorded higher plant height, plant dry weight, number of pods per plant, number of seeds per pod, 100 seed weight (8.59 g), seed yield (20.02 q ha^{-1}), straw yield (25.45 q ha^{-1}), and highest harvest index (44.29%) was recorded in the treatment 120% RDF and this treatment was found to be significantly superior over others. The treatment 120% RDF has recorded highest number of nodules per plant (25.09).

The highest B: C ratio (1.38) was fetched in the treatment 120% RDF and lowest (1.25) in the treatment of (100% RDF).

Keywords: Soybean, crop geometry, nutrient levels growth, yield and economics

Introduction

Soybean (*Glycine max* L. Merril), is commonly identified as the oilseed, occupies the coveted place with a top rank among oilseed crops of the world as well as India. In India the onset of commercial soybean production is nearly four decades ago. The crop has seen unprecedented growth in both region and development during this time. In Central and Peninsular India's rainfed agro-ecosystem, soya has developed themselves as a big monsoon season crop. The advent of soybean has contributed to an improvement in crop intensity and a consequent rise in productivity for every unit area. In India soybean remains a major crop of rain - fed oilseeds. It is a most important *Kharif* oilseed crop of Fabaceae family. Soybean has a prominent place among modern agricultural commodities. As the most common seed legume in the world, it contributes about 25% to the worldwide production of consumable oil, around 2/3 of the global protein concentrate for livestock feeding and is a important component in processed feed for poultry & fish. It is also an important commodity for food manufacturers, Pharma industry and many more industrial uses. Soybean plays a crucial part in India's agricultural economy. Soybean is a major contributor to countries total consumable oil collection. Soybean actually shares 43% to the overall oilseed & 25% to the country's overall oil supply. Soybean is grown in warm and humid weather, which is also conducive to the production of weed, provided that the conditions of its atmosphere in tropical and subtropical regions are generally more suitable for weed growth than in temperate regions. The ideal plant density with proper plant geometry depends on variety, its habit of growth, & agro-climatic situations. To get decent performance from this seed, the row to row spacing should be preserved with plant population.

Method and Materials

The field experiment was conducted at Tirhut College of Agriculture, Dholi (Muzaffarpur) under Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar. Geographically, TCA, Dholi (Muzaffarpur) is located on the southern bank of river *Burhi Gandak* @ an altitude of 58m above average sea level & lies at 25.59^0 N latitude & 85.35^0 E longitudes. Under humid sub-tropical climatic region that is strongly affected by monsoon.

Dholi Farm has sub-tropical & sub-humid climate with usual rainfall, hot dry summer & cool winter. Usually, monsoon starts in the 3^{rd} or 4^{th} week of June & proceeds till September. According to the Meteorological observatory records at TCA, Dholi, "the average annual rainfall is about 1163 mm, out of which nearly 735.8 mm is received during the monsoon extending from the middle of June to middle of October.

The maximum rainfall received during south-west monsoon from July to October. The period between Novembers to first half of the January, receives occasional and light winter shower. January is the coldest month of the year with an average maximum and minimum temperature of 23.2 °C and 7.9 °C, respectively. Normally temperature starts decreasing from the first fortnight of November and reaches the minimum in the end of December or early January. Again it starts rising from the end of February and reaches the maximum in May-June.

Normally temperature starts decreasing from the first fortnight of November and reaches the minimum in the end of December or early January. Again it starts rising from the end of February and reaches the maximum in May-June.

Certified seeds of JS-335 were used for seeding. The crop was sown on 17^{th} July, 2019 adopting recommended seed rate of 55-65 kg ha^{-1}. Sowing was done in- furrow opened by hand plough to a depth of 4-5 cm at different row spacing as per the plan of experiment. Seeds were treated with *Rhizobium* biofertilizer before sowing. Seeding was carried relatively at a higher seed rate to ensure the desired plant population within a row. The plant population was maintained by thinning out extra plants & 15 days after sowing when all the plants emerged out.

A steady dose of 25:80:40 kg ha^{-1} nitrogen, phosphorus, and potassium were applied through Urea, SSP & MOP. N: P_2O_5:K_2O was applied according to the treatment details.

Results

Growth attributing characters.

Table 1: Effect of crop geometry & nutrient levels on plant height (cm) at different growth stages.

Treatments	30 DAS	60 DAS	90 DAS	At harvest
Crop geometry				
P1- 30 X 10 cm	24.40	44.81	45.61	47.71
P2- 45 X 5 cm	24.77	46.08	47.09	49.69
P3- 45 X 10 cm	24.56	45.72	46.86	49.00
P4- 45 X 15 cm	22.84	44.99	45.97	47.89
S.Em.±	0.60	1.29	1.14	1.48
CD (P=0.05)	1.75	3.80	3.33	5.00
Fertilizer levels				
F1- 100% RDF	24.01	43.63	44.99	47.85
F2- 120% RDF	23.84	45.89	45.97	48.61
F3- 140% RDF	24.58	46.68	48.18	49.26
S.Em.±	0.52	1.12	0.98	1.48
CD (P=0.05)	1.52	3.28	2.88	4.33

The significantly highest plant elevation (49.69 cm) was registered in the treatment 45 cm×5 cm as compared to 30 cm×10 cm (47.71 cm) and 45 cm x 15 cm (47.89 cm) which was statistically at par with 45 cm×10 cm (49.00 cm).

Nutrient levels also cause significant influence on plant height. Maximum plant elevation (49.26 cm) was registered in the treatment 140% RDF (NPK) which was considerably superior to the 100% RDF (47.85 cm). However, it was statistically equivalent to the treatment 120% RDF (48.61 cm).

Table 2: Influence of crop geometry & nutrient levels on Plant dry weight (g plant-1) at different growth stages.

Crop geometry				
Treatments	**30 DAS**	**60 DAS**	**90 DAS**	**At harvest**
P1- 30 X 10 cm	1.01	6.17	14.78	21.20
P2- 45 X 5 cm	1.01	7.36	16.27	22.37
P3- 45 X 10 cm	1.09	5.40	13.82	18.16
P4- 45 X 15 cm	1.12	5.66	13.07	18.13
S.Em.±	0.002	0.04	0.34	0.16
CD (P=0.05)	0.01	0.12	1.01	0.47
Fertilizer levels				
F1- 100% RDF	1.02	5.75	13.67	19.81
F2- 120% RDF	1.06	6.29	14.58	19.83
F3- 140% RDF	1.11	6.40	15.20	20.25
S.Em.±	0.04	0.17	0.51	0.35
CD (P=0.05)	0.12	0.50	1.49	1.02

The average data on plant dry weight indicated that crop geometry had significant influence on it. The considerably higher plant dry weight (22.37 g/plant) was noted in the treatment 45 cm x 5 cm as compared to 45 cm×15 cm (18.13 g plant^{-1}) and 45 cm × 10 cm (18.16 g plant^{-1}) which was statistically equivalent with 30cm×10cm (21.20 g plant^{-1}).

Nutrient levels also cause significant impact on plant dry weight. The elevated plant dry weight (20.25 g/plant) was registered in the treatment 140% RDF (NPK) which was considerably superior to the 100% RDF (19.81 g plant^{-1}). However, it was statistically equivalent with the treatment 120% RDF (19.83 g plant^{-1}).

Table 3: Effect of crop geometry & nutrient levels on number of seeds pod-1 & test weight at the time of harvest.

Treatments	Number of seeds per pod at harvest	Test weight (100 seeds)	Number of pods per plant at harvest
P1- 30 X 10 cm	2.68	8.56	62.14
P2- 45 X 5 cm	2.81	8.56	65.92
P3- 45 X 10 cm	2.41	8.58	63.80
P4- 45 X 15 cm	2.44	8.57	61.03
S.Em.±	0.04	0.01	2.24
CD (P=0.05)	0.11	0.02	6.57
Fertilizer levels			
F1- 100% RDF	2.56	8.54	61.15
F2- 120% RDF	2.57	8.57	63.03
F3- 140% RDF	2.63	8.59	65.49
S.Em.±	0.03	0.08	1.94
CD (P=0.05)	0.09	0.22	5.69

The mean data on total quantity of seeds pod^{-1} showed that crop geometry had significant influence on it. The significantly highest quantity of seeds pod^{-1} (2.81) was observed in the treatment 45 cm x 5 cm which was superior to the 45 cm × 15 cm (2.44) and 45 cm × 10 cm (2.41) which was statistically at par with 30 cm × 10 cm (2.68).

Nutrient levels also cause significant influence on total quantity of seeds/pod. The maximum quantity of seeds pod^{-1} (2.63) was registered in the treatment 140% RDF (NPK) which was considerably superior to the 100% RDF (2.56). However, it was statistically equivalent with the treatment 120% RDF (2.57).

The information related to test weight (100 seeds) in terms of gram indicated that crop geometry had significant influence on it. The significantly maximum test weight (8.58 g) was noted in the treatment 45 cm × 10 cm which was superior to the 45 cm x 5 cm (8.56) and 30 cm × 10 cm (8.56) which was statistically at par with 45 cm × 15 cm (8.57).

Nutrient levels also cause significant impact on test weight. The highest test weight (8.59 g) was registered in the treatment 140% RDF (NPK) which was considerably superior to the 100 percent RDF (8.54). However, it was statistically equivalent with the treatment 120% RDF (8.57).

The average data on quantity of pods plant^{-1} indicated that crop geometry had notable impact on it. The significantly maximum quantity of pods plant^{-1} (65.92) was registered in the treatment 45 cm×5 cm which was superior to the 30cm×10cm (62.14) and 45 cm x 15 cm (61.03) which was statistically at par with 45 cm×10cm. Nutrient levels also cause significant impact on total quantity of pods/plant.

Table 4: Effect of crop geometry & nutrient levels on seed, straw yield & harvest index

Treatments	Seed yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)
P1- 30 X 10 cm	20.20	25.82	43.89
P2- 45 X 5 cm	21.19	26.30	44.57
P3- 45 X 10 cm	18.10	24.09	42.88
P4- 45 X 15 cm	17.84	23.88	42.71
S.Em.±	0.34	0.41	0.60
CD (P=0.05)	0.98	1.21	1.76
Fertilizer levels			
F1- 100% RDF	18.02	24.49	42.24
F2- 120% RDF	19.97	25.13	44.29
F3- 140% RDF	20.02	25.45	44.00
S.Em.±	0.29	0.36	0.52
CD (P=0.05)	0.85	1.04	1.52
Interaction between crop geometry and nutrient levels (P x F)			
S.Em.±	0.58	0.71	1.04
CD (P=0.05)	1.70	NS	NS

Evidently, seed yield data (q ha^{-1}) indicated that plant geometry had significant impact on economic yield. The significantly highest seed yield (21.19 q ha^{-1})) was registered in the treatment 45 cm x 5 cm which was superior to the 45 cm × 15 cm (17.84 q ha^{-1}) & 45 cm × 10 cm (18.10 q ha^{-1}) which was approximately equivalent to the 30 cm × 10 cm (20.20 q ha^{-1}).

Nutrient levels also cause notable impact on seed yield (q ha^{-1}). The highest seed outcome (20.02 q ha^{-1}) was registered in the treatment 140% RDF (NPK) which was notably superior to the 100% RDF (18.02 q ha^{-1}). However, it was approximately equivalent with the treatment 120% RDF (19.97 q ha^{-1}).

It is evident from the statistics on straw yield (q ha^{-1}) that crop geometry had notable influence on straw yield. The significantly elevated straw yield (26.30 q ha^{-1}) was registered in the treatment 45 cm x 5 cm which was superior to the 45 cm × 15 cm (23.88 q ha^{-1}) & 45 cm × 10 cm (24.09 q ha^{-1}) which was approximately equivalent with 30 cm × 10 cm (25.82 q ha^{-1}).

The data pertaining to HI (%) indicated that crop geometry had significant influence on it. The significantly highest harvest index (%) (44.57%) was recorded in the treatment 45 cm × 5 cm (44.57%) which was superior to the 45 cm × 15 cm (42.71%) and 45 cm × 10 cm (42.88%) which was statistically equivalent with 30 cm x 10 cm (43.89%).

Nutrient levels also cause significant influence on HI (%). The highest harvest index (%) (44.29%) was observed in the treatment 120% RDF (NPK) which was notably superior to the 100% RDF (42.24%). It was, however, approximately equivalent to the 140% RDF.

Table 5: Effect of crop geometry & nutrient levels on total cost of gross returns (₹ ha^{-1}), net return and B:C ratio.

Treatments	Cost of cultivation (₹ ha^{-1})	Gross returns (₹ ha^{-1})	Net returns (₹ ha^{-1})	B:C ratio
P1- 30 X 10 cm	33383	79904	46522	1.39
P2- 45 X 5 cm	34748	83659	48911	1.41
P3- 45 X 10 cm	32018	71788	39770	1.24
P4- 45 X 15 cm	31108	70800	39692	1.27
S.Em.±	-	1237	1237	0.04
CD (P=0.05)	-	3628	3626	0.11
Fertilizer levels				
F1- 100% RDF	31660	71560	39900	1.25
F2- 120% RDF	33152	78902	45749	1.38
F3- 140% RDF	33629	79152	45522	1.35
S.Em.±	-	1071	1071	0.03
CD (P=0.05)	-	3142	3142	0.09

It is evident from the statistics on total COC (Cost of cultivation) that crop geometry had a significant effect on it. Significantly maximum COC (34748 ₹ ha^{-1}) was registered in the treatment 45 cm x 5 cm which was higher to the 45 cm × 15 cm (31108 ₹ ha^{-1}) and 45 cm × 10 cm (32018 ₹ ha^{-1}) which was statistically equivalent with 30 cm × 10 cm (33383 ₹ ha^{-1}).

The maximum COC (33629 ₹ ha^{-1}) was registered in the treatment 140% RDF (NPK) which was significantly higher to the 100% RDF (31660 ₹ ha^{-1}). However, it was approximately equivalent with the treatment 120% RDF (33152 ₹ ha^{-1}).

Gross return

Gross returns at different crop geometry had a significant impact. The maximum gross return (83659 ₹ ha^{-1}) was registered under 45 cm x 5 cm which was superior to the 45 cm×15 cm (70800 ₹ ha^{-1}) and 45 cm × 10 cm (71788 ₹ ha^{-1}) and statistically at par with 30 cm × 10 cm (79904 ₹ ha^{-1}).

Nutrient levels also cause significant effect in the gross return. The maximum gross return (79152 ₹ ha^{-1}) was observed in the treatment 140% RDF (NPK) which was considerably superior to the 100 percent RDF (71560 ₹ ha^{-1}). However, it was statistically equivalent with the treatment 120% RDF (78902 ₹ ha^{-1}).

Net return

A thorough analysis of net return data reveals that crop geometry had a significant effect on it. Significantly maximum net returns (48911 ₹ ha^{-1}) was noted under 45 cm x 5 cm which was superior to the 45 cm × 15 cm (39692 ₹ ha^{-1}) and 45 cm × 10 cm (39770 ₹ ha^{-1}) which was statistically equivalent with 30cm×10cm (46522 ₹ ha^{-1}).

The highest net profit (45749 ₹ ha^{-1}) was observed under 120% RDF which was notably superior to the 100 percent RDF (39900 ₹ ha^{-1}). However, it was approximately equivalent with the treatment 140% RDF (45522 ₹ ha^{-1}).

Benefit: Cost Ratio

The data obtained on benefit: cost ratio that crop geometry had a considerable impact on B: C ratio (1.41) was registered significantly higher under 45 cm x 5 cm, which was superior to the 45 cm × 15 cm (1.27) and 45 cm × 10 cm (1.24). It was statistically at par with 30 cm × 10 cm (1.39).

The nutrient levels caused non-significant impact on B:C ratio. The higher B: C ratio (1.38) was registered under 120% RDF which was considerably superior to the 100 percent RDF (1.25). However, it was statistically equivalent with 140% RDF (1.35).

Discussion

Growth & yield performance of the crop is a dynamic feature of many biological processes occurring in the plant system that are changed by a number of endogenous & environmental issues. A physiologically robust photosynthesis process is must for better plant productivity & reduced crop weed revelry for better usage of nutrients, moisture, & solar radiation are known to improve the plant vigor considerably this pattern was fully reflected in the plant to plant spacing and usage of fertilizers. A rise in the deposition of plant dry matter aggregation at different stages of crop development due to more spacing and high fertilizers may be attributed to better usage of growth factors & maximum photosynthetic efficiency.

Different growth attributes like plant height, plant dry weight, total quantity of pods plant^{-1}, & total quantity of seeds pod^{-1} at harvest were directly or indirectly responsible for seed yield & straw yield of soybean.

The plant elevation increased with the rise in plant population due to rivalry for sunlight energy. Similar outcome was reported by *Faizrahman et al.* (2015) [2]. Different fertilizer levels exhibit notable impact on plant elevation; however, significantly highest plant height was registered in 140% RDF (NPK) which was notably superior to the 100% RDF. However, it was statistically equivalent with the treatment 120% RDF at 30DAS.

A similar pattern was observed in 60, 90 DAS, & at harvest. The plant height enhances with an increase in NPK levels, mainly nitrogen and essential mineral nutrient for plant growth. It is a part of chlorophyll, increases the rate of photosynthesis, imparts green color, and ultimately increases plant growth. Similar results were concluded by Dhadaveet *et al.* (2017) [1].

Different fertilizer levels exerted a significant impact on dry weight whereas significantly higher plant dry weight was recorded with 140% RDF (NPK) which was notably superior to the 100% RDF. However, it was statistically equivalent with the treatment 120% RDF @ 30 DAS. The plant dry weight recorded at 60, 90 DAS, & at harvest was followed similar trend. Maximum levels of fertilizers help to increase the total dry matter aggregation in plants. Plant dry weight increases with an increase in fertilizer levels. A similar output was also recorded by Raghuveer *et al.* (2015) [5].

The yield is a feature of the interaction between yield characteristics & the development characters. The grain yield of soybean relies upon the total quantity of pods/plant, total quantity of seed/pod, & test weight. The relative quantity of these yield characteristics varies gradually with varying agronomic activities. The weight of grains is determined after drying. The growth & development research conducted during these stages aided to explain the differences in seed yield of the soybean crops.

Soybean seed yield is considerably affected by the planting geometry and fertilizer levels. Different plant spacing exerted considerable impact on yield. Significantly maximum seed output was noted with 45x5 cm as compared to 45x10 cm and 45x15 cm. The optimum spacing for soybean is 45 cm x 5 cm which is at par with 30x10 cm. If the plant population is more than optimum than the plant undergoes a severe competition for available soil resources and if the plant population is lower than the optimum, as in the case of 45x15 cm leads to underutilization of available recourses, which intern reduces the total economic yield. Khanam *et al.* (2016) [3].

Different fertilizer levels exhibited a significant influence on seed yield. In case fertilizer levels the maximum seed yield was registered with 100% RDF (NPK) as compared to 100% RDF however it was equivalent with 120% RDF. The yield was raised with an increase in fertilizer levels. Sowing of the soybean with different crop geometry and nutrient levels influenced the COC, gross returns, B: C ratio was registered.

Considerably higher gross returns, net profit & B: C ratio was noted in 45x5 cm as compared to 45x10 cm and 45x15 cm. Among the nutrient levels the highest gross returns was noted in 140% RDF (NPK) which was statistically superior to 100% RDF but was equivalent with 120% RDF (NPK). However, highest B: C ratio was exhibited by 120% RDF level nutrient over other treatments & higher net return was recorded in 120% RDF, which was statistically equivalent with 45 x 10 cm. Sowing of the crop with optimum plant spacing led to increase in gross returns, net profit & B: C ratio due to higher seed yield & straw yield reported by *Patel and Patel* (2013) [4]. Higher gross returns, net profit & B:C ratio with maximum level of nutrients has been indicated by Sher *et al.* (2015) [6].

Conclusion

Higher growth & yield characteristics *viz.* plant height (49.69 cm), dry weight (22.37g plant^{-1}), effective number of nodules (18.51), total quantity of pods/plant, highest quantity of seeds/pod, grain yield (21.19 q/ha), & straw yield (26.30 qha^{-1}) were recorded in crop geometry with spacing 45 cm x 5 cm. The treatment with crop geometry (30cm x 10 cm) was at par with 45 cm x 5 cm. Nutrient management treatment 120% RDF and 140% RDF resulted significantly higher growth parameters over 100% RDF.

The best BC ratio 1.41 was found in crop geometry (45 cm x 5 cm) with net profit of (48911 ₹ha^{-1}) & gross return (83659₹ha^{-1}) under (45 cm x 5 cm) than (45x10cm) and (45x15 cm). But, it was found equivalent with (30x10 cm). In case of nutrient levels (120% RDF) have resulted significantly higher net profit & B: C ratio than (100% RDF). However, it was found equivalent with (140% RDF).

Crop geometry (45 x 5 cm) and (120%) nutrient level for the commercial cultivation of the soybean crop to the farming community.

Acknowledgement

We sincerely acknowledge DRPCAU, Pusa, Bihar the for taken consideration about conducting the research.

References

1. Dhadaveet KS, Kulkarni RV, Pawar RB, Patil DS, Khot GG. Effect of integrated phosphorus management on yield, nutrient uptake of Soybean grown on 'p' deficient soil. International Journal of Current Microbiology and Applied Sciences. 2017;7(11):1033-1040.
2. Faizrahman I, Rana KS, Anil KC, Anchal D, Qudratullah E, Amin UN. Effect of varieties and planting geometry on growth, yield and profitability of *Kharif* mungbean [*Vigna radiata* (L.) Wilezek] in southern Afghanistan. Annlas of Agricultural Research. 2015;38(2):185-193.
3. Khanam M, Islam MS, Ali MH, Chowdhury IF, Masum SM. Performance of soybean under different levels of phosphorus and potassium. Bangladesh Agronomy Journal. 2016;19(1):99-108
4. Patel CR, Patel JR. Yield, economics and energetic of soybean as influenced by integrated nutrient management and genotype. Journal of Agricultural Research and Technology. 2013;38(1):167-170.
5. Raghuveer JA, Hosmath K, Chandranath HT. Effect of different levels of nitrogen and phosphorus on growth and Yield parameter of soybean (*Glycine max* L. Merrill). International Journal of Pure & Applied Bioscience. 2015;5(4):1686-1690.
6. Sher Singh, Anuradha B, Bisht JK. Growth, productivity and economics of soybean genotype under varying planting densities. Soybean Research. 2015;13(1):82-88.