Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2020; 9(1): 216-221
Received: 03-11-2019
Accepted: 06-12-2019

Chandraprakash Verma
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Dr. VK Tripathi
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Dr. Indrapal Singh
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Chandraprakash Verma
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Response of newly released varieties of soybean [*Glycine max* (L.) Merrill] to crop geometry planted on ridge and furrow system

Chandraprakash Verma, Dr. VK Tripathi and Dr. Indrapal Singh

Abstract
A field experiment was conducted at Research cum Instructional Farm, IGKV, Raipur, during rainy season of 2018. Optimum plant population is pre requisite obtain higher seed production and productivity of soybean. These was obtained on varieties and plant geometry (cm). Soybean variety RSC 1046 was recorded significant higher plant population, Plant height, number of branches plant^{-1} dry matter accumulation plant^{-1}, Leaf area index plant^{-1} and seed yield. Crop geometry was recorded significant maximum plant population and plant height in 45×5, number of branches plant^{-1} and dry matter accumulation plant^{-1} in 45×10 leaf area index plant^{-1} in 45×5 and seed yield in 45×10. Interaction effect in seed yield was recorded between variety and crop geometry (cm). RSC 1046 and 45×10 show significant higher seed yield. Relationship between plant population and seed yield (kg ha^{-1}) was linear with performance maximum in variety RSC 1046 and crop geometry (cm) 45×10. That results shows optimum plant population due to variety and crop geometry produce higher pre harvest parameters and yield soybean planted in ridge and furrow system.

Keywords: Varieties of soybean, *Glycine max* (L.) Merrill, geometry planted

Introduction
Soybean is one of the major oilseed crops widely grown as a valuable source of protein and oil for human nutrition. Chemical analysis revealed that soybean seed contains approximately 20% oil, 40% protein, 30% carbohydrates, 10% total sugar and 5% ash. Further, soybean meal also has high content of minerals, particularly calcium, phosphorus and iron (Iıta, 1992; Iıta, 1993) [6, 7] and its seed oil is rich in essential fatty acids (Acikgoz *et al*., 2009) [1]. Its protein is complete and contains all the essential amino acids therefore all nutrition factors terms truly it's as miracle bean. It also be contains a well amount of salts, vitamins and health promoting phyto-chemicals for human and livestock. Soybean is an environment friendly grain legume and its builds up the soil fertility by fixing a large amount of atmospheric nitrogen through the root nodules and leaf fall on the ground at maturity. The nodulated soybean plants can be fix about 94 kg of nitrogen ha^{-1} in one crop season (Sattar, 2001) [14]. India is the lead third postion of largest edible oil economy in the world after USA and China. In India, during 2000, its cultivation occupies an area of 12.2 million hectares with production was 89.19 lakh tones 2015-16 along with average productivity of 922 kg ha^{-1} 2017-18 (Anonymous, 2018) [2]. Agronomic research, main aim at improving cultural practices of crop varieties to return optimum yield. Crop geometry is one of the major factors that has an import role on growth and yield of soybean planted on ridge and furrow system. Optimum row and intra row plant spacing essential for plant early canopy coverage due to plant above and below ground parts of plant through efficient utilization of natural resources *viz.* solar radiation, land space, nutrients and water. Alternation in crop geometry of varieties by way of manipulation of inter and intra row plant spacing without changing plant density, particularly in high plant density crops like soybean may also play important role smothering weeds and increasing the crop productivity. Either higher or lower density of plants than the optimum leads to the reduction in seed yield. Beneficial effects of ridge and furrow method of sowing on soybean yield have been reported through an improved soil aeration, moisture, temperatures, better root development and nitrogen fixation (Raut *et al.*, 2000) [13].

Material and Methods
A field experiment was conducted at Research cum Instructional Farm, IGKV, Raipur, during rainy season of 2018. The experimental soil was clay in texture with pH 7.42 EC 0.30 dsm^{-1}, organic carbon 0.64%, low in available nitrogen (231.7 kg ha^{-1}), medium in phosphorus (22.71

kg ha^{-1}) and high in available potassium (346.4kg ha^{-1}). The experiment was laid out in split plot design with three replication. The treatments was consisted of two varieties CG Soya 1 and RSC 1046 and four crop geometry (cm) 45×5, 45×10, 45×5 and 45×10. Varieties in main plot and crop geometry in sub plot are adopted. Crop was sown in first week of July. Recommended dose of fertilizer applied 25 kg ha^{-1} of nitrogen, 40 kg ha^{-1} phosphorus and 60 kg ha^{-1} potassium. Crop planting was third July and harvest in last week of October. Five plants were taken for recording growth parameters. The seed yield was taken plot wise and converted into kg ha^{-1}. Optimum plant population and crop geometry are important factor for obtaining high seed yield of soybean. The aim of the present study was to find out optimum plant population and crop geometry planted in ridge and furrow system.

Result Discussion

Effect of Varieties and Crop Geometry in growth Parameters of Soybean

The data was showed in Table 1 and Figures 1 and 2. The result revealed that variety RSC 1046 was recorded significant maximum tallest plant, maximum number of branches $plant^{-1}$, dry matter accumulation $plant^{-1}$ and leaf area index as compared to CG Soya 1. Crop geometry (cm) was recorded significant tallest plant in 45×5, followed by 45×10, 45×20 and smallest in 45×30. The increase in plant height at closer spacing might have been caused due to increased plant population density. The higher population density caused mutual shading in plants that contributed to stem elongation and ultimately plant height increased. Similar results were also reported by Pendersen and Lauer (2003) [8] and Rahman *et al.* (2004). Crop geometry was recorded significantly maximum number of branches $plant^{-1}$ in 45×30, followed by 45×20, 45×10 and lowest in 45×5. Narrow spacing planting of crop increasing plant densities, increase of plant density, decreased the number of branches $plant^{-1}$ due to plants at higher densities accumulate less carbon which is not sufficient to support more branching. Similar results have been reported by Reddy *et al.* (1999) [12], Rahman *et al.* (2004), Blumenthal *et al.* (1999) [3], Shamsi and Kobraee (2011) [15]. Crop geometry was recorded significantly maximum dry matter accumulation in 45×30, followed by 45×20, 45×10 and lowest in 45×5. Dry matter accumulation were highest in ridge sowing as compared to flat sowing. Growth and yield attributes were highest in ridge sowing Ralli and Dhingra (2003) [10]. Crop geometry was recorded significant maximum leaf area index $plant^{-1}$ in 45×5, followed by 45×10, 45×20 and minimum in 45×30. Ibrahim (1996) [5] also reported that leaf area index increased with increasing plant density its direct related to close plant spacing.

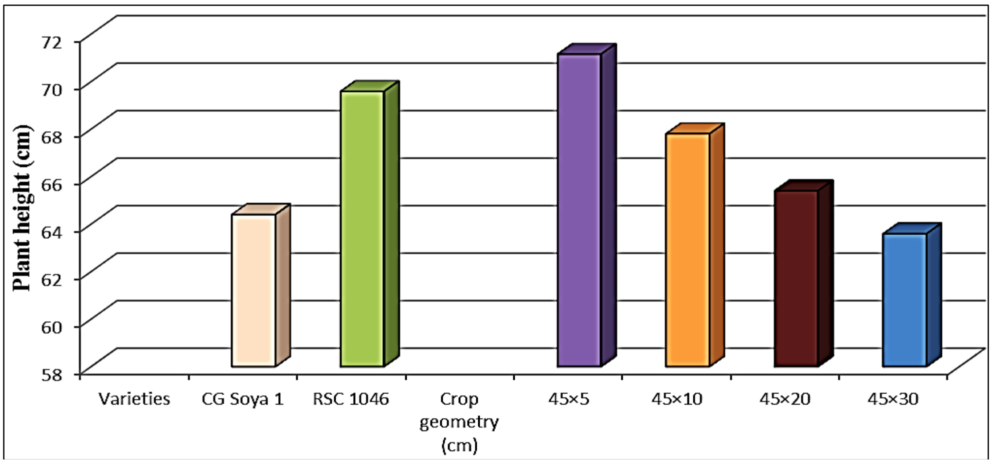

Fig 1: Plant height (cm) as influenced by varieties and newly released soybean varieties planted in ridge and furrow system

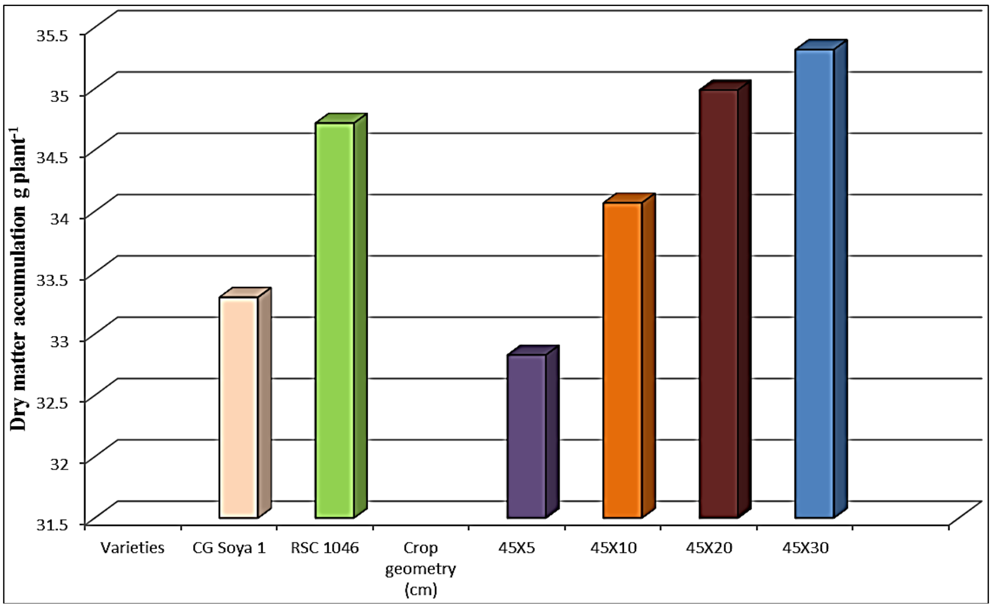

Fig 2: Dry matter accumulation g $plant^{-1}$ influenced by varieties and newly released soybean varieties planted in ridge and furrow system

Effect of varieties and crop geometry in yield attributes and yield of soybean

The data was showed in Table 2 and 3 and figures in 3, 4, 5, 6 and 7. Significantly maximum plant population (No m^2) was recorded in variety RSC 1046 and lowest in CG Soya 1. Crop geometry (cm) was recorded significantly maximum plant population in 45×5, followed by 45×5, 45×5 and lowest in 45×30. The data revealed that significantly higher number of pods $plant^{-1}$ was recorded in variety RSC 1046 and lowest in CG Soya 1. Crop geometry (cm) was recorded significant higher number of pods $plant^{-1}$ in 45×10 and lowest in 45×5. The data revealed that significantly maximum number of seed pod^{-1} was recorded in variety RSC 1046 and lowest in CG Soya 1. Crop geometry (cm) was recorded significant higher number of seeds pod^{-1} in 45×10 was and lowest in 45×5.

Table 1: Response of newly released soybean varieties and crop geometry planting in ridge and furrow system on growth parameters of soybean

Treatment	Plant height (cm)	No. of branches $plant^{-1}$	Dry matter accumulation g $plant^{-1}$	leaf area index
Varieties				
CG Soya 1	64.41	6.21	33.3	2.45
RSC 1046	69.59	6.88	34.72	2.68
S.Em ±	0.62	0.02	0.21	0.02
CD (P=0.05%)	1.62	0.08	0.84	0.03
Crop geometry (cm)				
45×5	71.16	5.91	32.83	4.82
45×10	67.81	6.33	34.07	2.91
45×20	65.41	6.66	34.99	1.46
45×30	63.6	7.25	35.32	1.05
S.Em ±	0.77	0.17	0.22	0.02
CD (P=0.05%)	1.83	0.54	0.7	0.1

Table 2: Response of newly released soybean varieties and crop geometry planting in ridge and furrow system on yield attributing parameters and yield

Treatment	Plant population (No. m^2)	No. of pods $plant^{-1}$	No of seed pod^{-1}	100 seed weight	Seed Yield (kg ha^{-1})
Varieties					
CG Soya 1	15.50	59.28	2.62	10.02	1367
RSC 1046	15.83	61.27	3.12	10.13	1475
S.Em ±	0.03	0.28	0.03	0.06	14.9
CD (P=0.05%)	0.16	1.09	0.14	NS	58.53
Crop geometry (cm)					
45×5	31.5	55.96	2.41	10.16	1778
45×10	16.5	62.46	3.16	10.21	1939
45×20	8.50	57.78	3	10.34	1166
45×30	6.16	61.9	2.91	10.46	799
S.Em ±	0.23	0.89	0.11	0.19	51.7
CD (P=0.05%)	0.72	2.75	0.34	NS	159.33

Table 3: Interaction effect of seed yield (kg ha^{-1}) on newly released soybean varieties and crop geometry (cm) planting in ridge and furrow system

Treatment	Crop geometry (cm)				
	45×5	**45×10**	**45×20**	**45×30**	**Mean**
Varieties					
CG Soya 1	1786	1777	1232	672	1366
RSC 1046	1771	2101	1100	927	1474
Mean	1778	1939	1166	799	
	S.Em ±	CD (P = 0.05)			
Varieties	18.90	53.53			
Crop geometry (cm)	51.70	159.33			
Interaction	14.90	58.53			

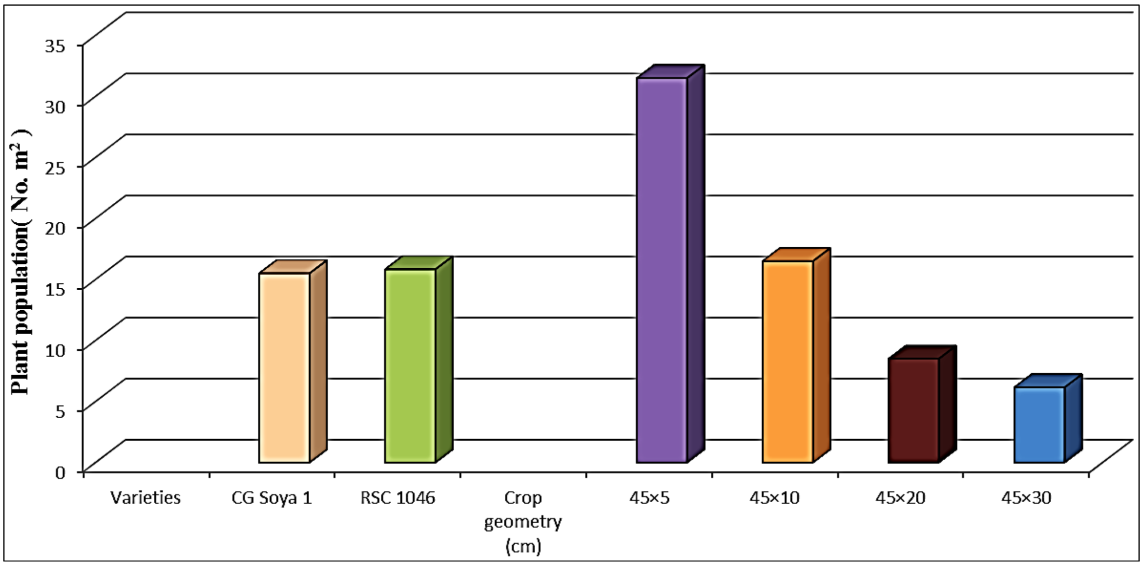

Fig 3: Plant population (No. m^2) as influenced by varieties and newly released soybean varieties planted in ridge and furrow system

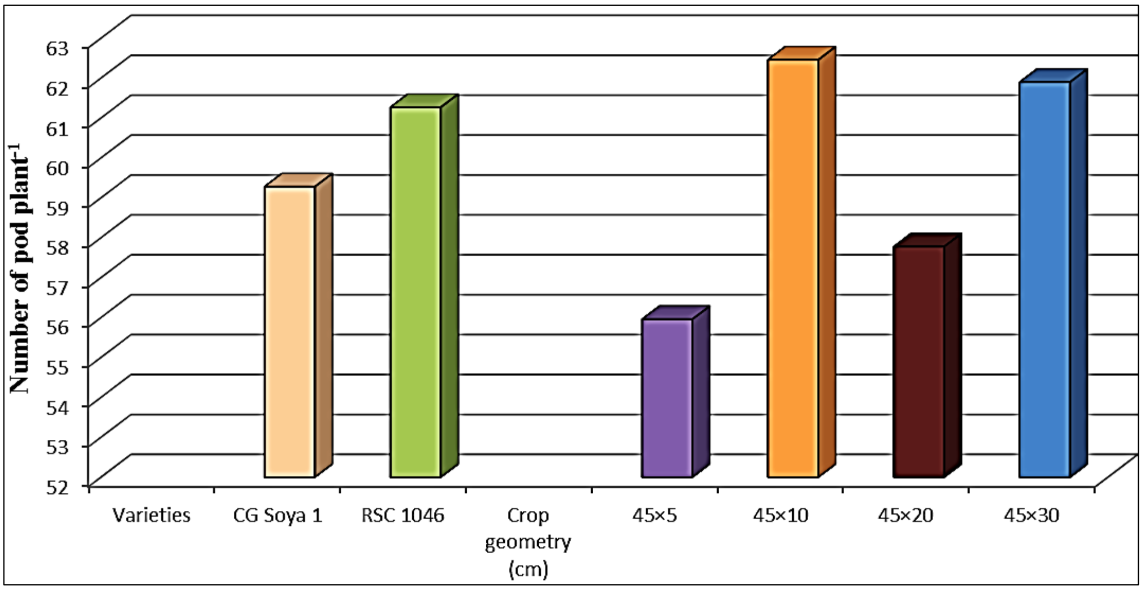

Fig 4: Number of pod plant^{-1} as influenced by varieties and newly released soybean varieties planted in ridge and furrow system

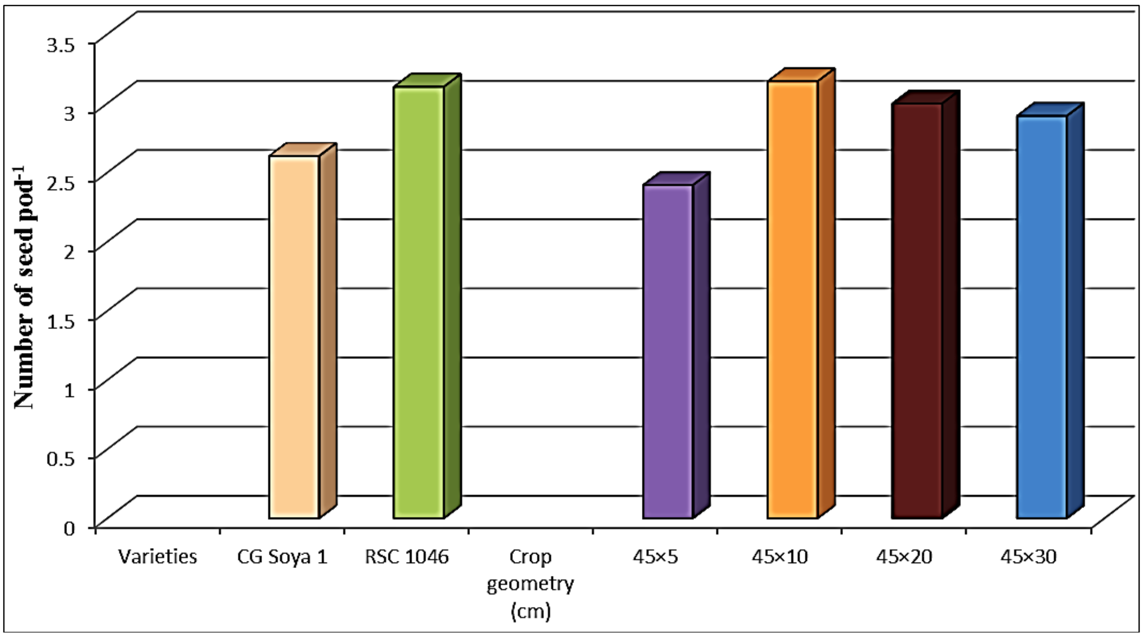

Fig 5: Number of seed pod^{-1} as influenced by varieties and newly released soybean varieties planted in ridge and furrow system

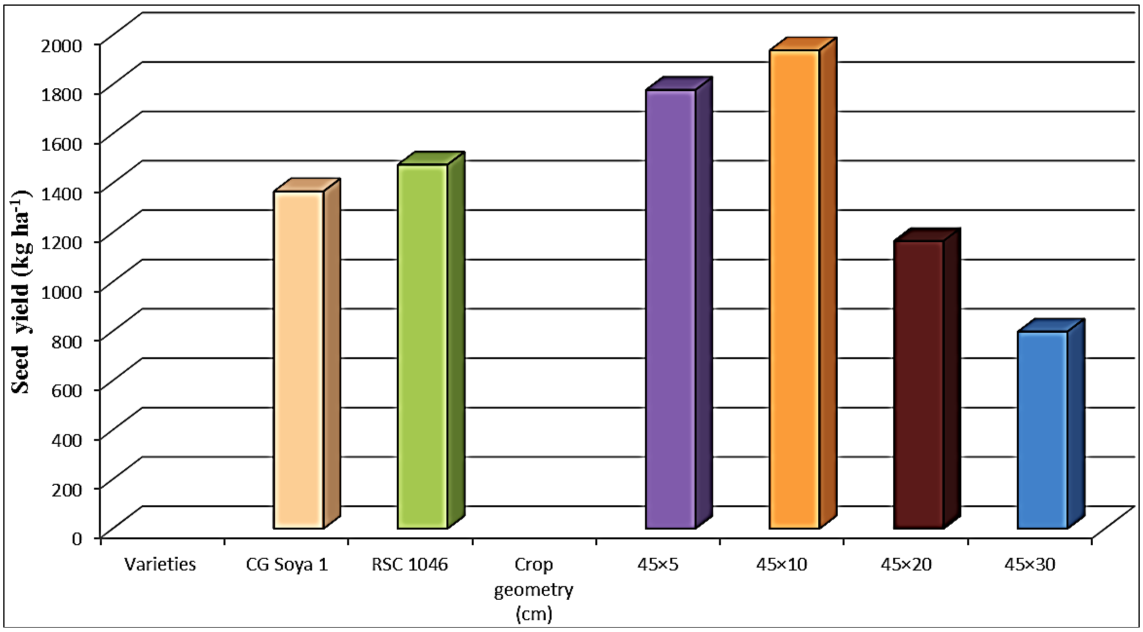

Fig 6: Seed yield (kg ha^{-1}) as influenced by varieties and newly released soybean varieties planted in ridge and furrow system

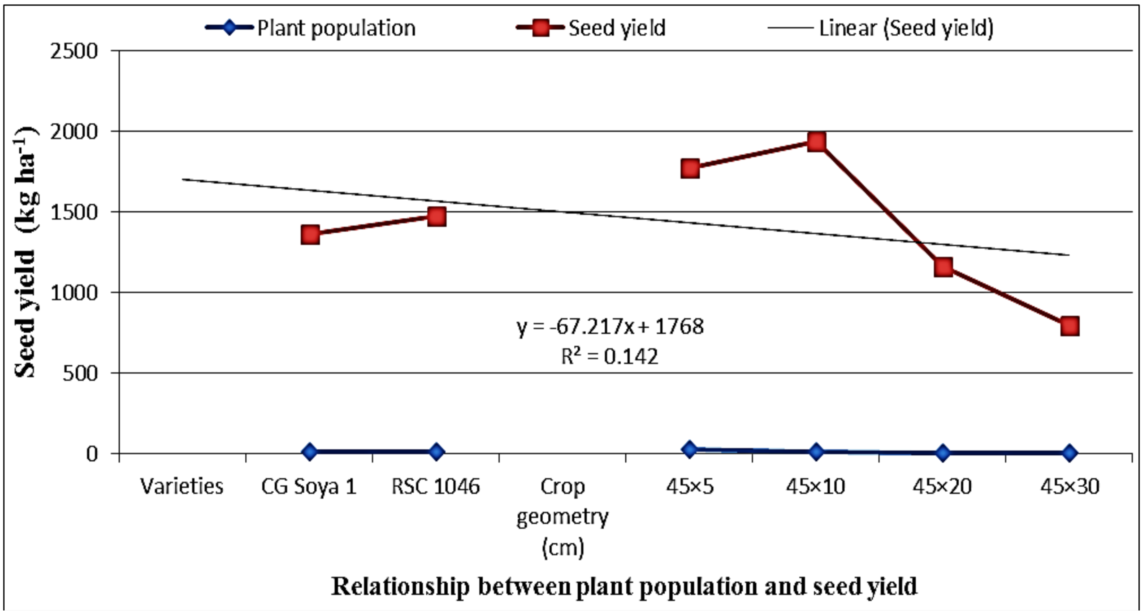

Fig 7: Relationship (regression) between plant population (No. m^2) and seed yield (kg ha^{-1}) as influenced by varieties and newly released soybean varieties planted in ridge and furrow system

100 seed weight (g) was recorded no significant difference in varieties and crop geometry. Narrow row and plant spacing ensured early canopy coverage and maximum light interception, crop growth rate and crop biomass, resulting in increased number of pod $plant^{-1}$, no. of seed pod^{-1} and yield potential per unit area. Similar results have been reported by Boydak *et al*. (2004) and Malek *et al*. (2012). Soybean was recorded significant higher seed yield in variety RSC1046 and lowest seed in CG Soya 1. Crop geometry was recorded significant seed yield in 45×10 and minimum seed yield in 45×30. The interaction effect observed in seed yield. interaction show combination of treatment variety and Crop geometry (cm) was highest seed yield obtained in RSC 10 46 with spacing 45×10 and lowest in CG Soya 1 with Spacing 45×30. Singh (2011) [16] reported that higher seed yield at the highest plant population level due to better plant growth, more pod per unit area and higher biological yield.

Relationship between plant population and seed yield (kg ha^{-1}) was linear with performance maximum in variety RSC 1046 and crop geometry (cm) 45×10.

Conclusion

There research programme was recorded variety RSC 1046 best performance as compared to CG Soya 1 in terms of growth parameters, yield attributes and yield. Crop geometry was performance recorded in 45×10 higher in terms of growth parameter, yield attributes and yield as compared to all other crop geometry. Interaction effect in seed yield. Variety RSC 1046 and crop geometry (cm) 45×10 was recorded significant higher seed yield as compared to all combination planted on ridge and furrow system. Relationship between plant population and seed yield (kg ha^{-1}) was linear with performance maximum in variety RSC 1046 and crop geometry (cm) 45×10.

References

1. Acikgoz E, Sincik M, Karasu A, Tongel O, Wietgrefe G, Bilgili U *et al*. Forage soybean production for seed in mediterranean environments. Field Crops Research. 2009; 110:213-218.
2. Anonymous, 2018. www.indiastat.com
3. Blumenthal MJ, Quach VP, Searle PGE. Effect of soybean population density on soybean yield, nitrogen accumulation and residual nitrogen. Australian Journal of Exp. Agrriculture. 1999; 28:99-106.
4. Dhakad SS, Vijay Agrawal, Sanjeev Verma. Effect of ridge and furrow system on the growth character and productivity of rainfed soybean in Vidisha district of M.P. Research Environment. Life Sciences. 2014; 7(3):211-212.
5. Ibrahim ME. Response of determinate and indeterminate soybean cultivars to planting pattern and density. Annual Agriculture Science. 1996; 34:1431-1456.
6. Iita. Soybean Production Training Manual. International Institute of Tropical Agriculture, USA, 1992, 341.
7. Iita. Archival report (1988-1992), crop improvement division, grain legume improvement program part III. International Institute of Tropical Agriculture, Soybean Biological Nitrogen Fixation, 1993, 10.
8. Pendersen P, Lauer JG. Corn and soybean response to rotation sequence, row spacing and tillage system. Agronomy Journal. 2003; 95:965-997.
9. Rahman MM, Rahman MM, Hossain MM. Effect of row spacing and cultivar on the growth and seed yield of soybean (*Glycine max* [L.] Merrill) in *Kharif*-II season. The Agriculturists. 2013; 11(1):33-38.
10. Ralli S, Dhingra KK. Response of soybean to different planting methods. Annals of Biology. 2003; 19(2):151-155.
11. Rasul F, Cheema MA, Sattar A, Saleem MF, Wahid MA. Evaluating the performance of three mung bean varieties grown under varying inter-row spacing. Journal of Animal & Plant Sciences. 2012; 22(4):1030-1035.
12. Reddy VR, Timlin DJ, Pachepsky YA. Quantitative description of plant density effects on branching and light interception in soybean. Biotronics. 1999; 28:73-85.
13. Raut VM, Taware SP. Comparison of different sowing methods in soybean. Journals Maharashtra Agriculture. University. 2000; 25(2):218-219.
14. Sattar MA. Biofertilizer in Bangladesh: Problem and prospect. In: Proc. third national workshop on pulses, 11-12 June, BARC, Farmgate, Dhaka. 2001; 1207:95-102.
15. Shamsi K, Kobraee S. Soybean Agronomic response to plant density. Annals of Biological Research. 2011; 2(4):168-173.
16. Singh G. Response of soybean [*Glycine max* (L.) Merrill] genotype to plant population and planting geometry in Northern India. International Journal of Agricultural Research. 2011; 6(8):653-659.
17. Walker ER, Mengistu N, Bellaloui CH, Korger RK Roberts, Larson JA. Plant population and row spacing effects on maturity group III soybean. Agronomy Journals. 2010; 102:821-826.