International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(6): 2159-2162

Received: 14-09-2018
Accepted: 18-10-2018

Ankita Negi
Department of Agronomy, GBPUA&T, Pantnagar, Uttarakhand, India

Aaradhana Chilwal
Research scholar, Punjab Agriculture University, Ludhiana, Punjab, India

Correspondence
Ankita Negi
Department of Agronomy, GBPUA&T, Pantnagar, Uttarakhand, India

Effect on quality and analysis of economics of soybean under different varieties and land configurations in mollisols of Himalayan *Tarai*

Ankita Negi and Aaradhana Chilwal

Abstract
Soybean contains lysine rich 40-42% protein, 20-22 percent oil high in essential fatty acid. It provides phytochemicals which protect human body against cancers and diabetes. It is a key component of global food security and so it is important to maintain its quality economically in order to face off problem of malnutrition. In the face of development of new varieties with variable genetic potential, it is of utmost importance to analyse their potential under different agro-techniques for the production of better yield, quality and quantity wise. The present study was thus planned to analyse the economics of soybean production and effect on its quality under different varieties and land configurations in mollisols of himalayan *tarai.* The present experiment was conducted during the *kharif* season of 2017, in C5 block of N.E. Borlaug Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar (Uttarakhand). Treatments consisted of three land configurations (Flat bed, ridge and furrow and raised bed) and varieties (PS-1092, PS-1225 and PS-1347) were set out in split plot design keeping land configurations in main plot and varieties in sub plot with three replication. Protein and oil content were not affected by land configuration and varieties. The gross, net returns and Benefit cost ratio were significantly highest with ridge & furrow method of sowing. Variety PS-1225 recorded significantly higher protein yield than other varities followed by PS-1347. All the economic parameters were the highest with variety PS-1225 and significantly higher than both remaining varieties. The study revealed that quality of soybean was not much affected by varieties and land configuration, however, economically, ridge & furrow method of sowing and variety PS-1225 were found to be better than others without having any interaction among them.

Keywords: land configuration, flat bed, ridge and furrow, raised bed, cost ratio, protein content

Introduction
In India, soybean was introduced in 60s as a supplementary oilseed crop to overcome the shortage of edible oil. It contains lysine rich 40-42% protein, 20-22 percent oil high in essential fatty acid. It provides phytochemicals which protect human body against cancers and diabetes (Chouhan, 2007) [7]. It is a key component of global food security, which provides high protein animal feed and over half of the world's oilseed production (Ainsworth *et al.*, 2011) [1]. Shinde *et al.* (2000) [10] observed that the protein per cent in seed and protein yield was significantly more in ridges and furrows with 90 cm width than that of ridges and furrows with 60cm and flat bed. Tomar *et al.*(2016) [11] field experiment was conducted during *kharif* season at crop research centre of Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut (UP) on effect of land configuration, nutritional management module and biofertilizer application on performance, productivity and profitability of urdbean, they concluded that under land configuration used in the context of protein content (%) and protein yield (kg/ha) shown some differences associated with the field preparation. Raised bed planted urdbean produces significantly higher mean protein content (21.4%) and protein yield (209.9 kg/ha) over flatbed planted. Higher protein content in grains was mainly due to the more nitrogen content in grains and higher grain yield which in turn improved the protein yield. At Parbhani, Maharashtra, Bhale *et al*. (2008) [2] while working on resource conservation technologies to enhance productivity of soybean (*Glycine max*) – *Rabi* sorghum (*Sorghum bicolor*) sequence observed the higher net monetary returns of Rs.3737/ha from ridges and furrow treatment than flatbed treatment. Under high rainfall conditions of Chhattisgarh Lakpale and Tripathi (2012) [5] found that net returns (Rs. 22880/ha) and B:C ratio 2.57 of soybean were the maximum under ridge and furrow planting,

however the net returns was found comparable with bed planting with 4 rows (Rs.20330/ha) with B: C ratio 2.52. From Muzaffarpur, Bihar Pandey *et al.* (2014) [6] reported that raised bed planting of pigeonpea significantly increased the net return (18.6%) as compared to flat bed. In Iran, Seyyed *et al.* (2013) [8] studied quality of 3 cultivars (Hill, Sahar, Zan) in soybean. The oil and protein percent differed significantly among the cultivars. The maximum oil content (20.17%) was recorded in cultivar Zan, but higher protein was recorded in Sahar (36.12%). Pawar *et al.* (2015) [7] evaluated 2 varieties (JS 335 and MAUS 71) for their protein and oil content. Variety MAUS 71 had significantly higher protein (38.04%) and oil (19.10%) contents over the JS 335. Sher *et al.* (2015) [9] found that there was not much difference in the cost of cultivation for different genotypes but gross returns, net-returns and B:C ratio differed significantly across the genotypes The highest gross returns (Rs 58826/ha), net returns (Rs 29859/ha) and B:C ratio (2.03) were recorded with VL Soya 76 attributing its statistically higher economic and biological yields. Dubey *et al.* (2014) [4] revealed that among the 12 varieties of soybean, JS 97-52 recorded highest net monetary returns up to (Rs. 40090/ha) with B:C ratio of 2.90. Two varieties *viz*. JS 20-35, JS 20-09 also performed better as compared to other varieties which gave net monetary returns of Rs. 33,399/ha and Rs. 29881/ha with B:C ratio of 2.58 and 2.42, respectively.

The above studies demonstrated the significant impact of land configuration and varities on quality of soybean and economics of soybean production. But the studies testing the interaction of these two factors on quality and economics are few. But with the aim of feeding growing population with high nutrition food economically, it becomes important to develop land configuration most suited to high nutritional varieties. Thus the present study was carried out with the aim to analyse the economics of soybean production and effect on its quality under different varieties and land configurations in mollisols of himalayan *tarai.*

Materials and Methods

The field experiment was conducted in *Kharif* season of 2017 in C5 block at the Norman E. Borlaug Crop Research Centre of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U.S. Nagar), Uttarakhand, India. Geographically, Pantnagar is situated in the *Tarai* area which is narrow belt in the foothills of Shivalik range of Himalayas at 29°N latitude and 79.5°E longitude and at an altitude of 243.8m above mean sea level. The experimental soil was low in available nitrogen, medium in organic carbon but high in phosphorus and medium in potassium. The experiment was conducted in split plot design with 3 land configurations (Flat sowing, Ridge and furrow sowing and Raised bed sowing) in main plot and 3 varieties of soybean (PS -1092, PS -1225 and PS -1347) in sub-plot.

In flat sowing soybean was sown in rows open 45 cm apart. Land configuration viz., ridge and furrow and raised beds were made manually with small spade. Distance between center to center of furrows was 45cm in ridge and furrow system. One row of soybean was sown on the ridge. In raised bed system, distance between center to center of furrows was 90cm. Two rows of soybean were sown on a bed at 30cm apart. Thinning was done between 20-22 days after sowing (DAS) to maintain spacing between 10±2 cm.

Varieties tested were: PS-1092- purple flowers, yellow seed colour with black hilum colour, tawny pubescence, determinate growth type, pod colour is brown, spherical seed shape, short plant height, erect growth habit with pointed ovate leaf shape. The duration of its growth is 118-120 days. Recommended for *tarai* and *bhabar* region of UP, Uttarakhand and upto mid hills of Uttarakhand. PS-1225 - white flowers, yellow seed colour with brown hilum colour, grey pubescence, semi-determinate growth type, pod colour is yellow, spherical seed shape, medium plant height, semi-erect growth habit with pointed ovate leaf shape. PS-1347 - white flowers, yellow seed colour with brown hilum colour, tawny pubescence, determinate growth type, pod colour is brown, elliptical seed shape, short plant height, semi-erect growth habit with lanceolate leaf shape. The duration of its growth is 120-125 days. The suitable areas of its cultivation are Northern Plain Zone, UP, UK, Delhi, Punjab, etc.

Results and Discussion

Quality Parameters

Protein content in grain

An appraisal of the data pertaining to protein content and protein yield of soybean is given in Table 1. Land configuration and varieties failed to affect the protein content significantly. The highest value was obtained in ridge & furrow and the lowest in flatbed. Among varieties, PS-1225 recorded the maximum protein content followed by PS-1347 and PS-1092. Protein content was not affected significantly by different land configurations and varieties as protein content of grain is just a numerical value which is directly calculated from nitrogen content of grain by multiplying with a constant 6.25.

Protein Yield

The protein yield of soybean increased significantly by different land configurations and varieties. Ridge & furrow method yielded significantly higher than other two configurations. Rraised bed and flatbed methods recorded at par protein yield with each other. Variety PS-1225 recorded significantly higher protein yield than both the remaining varities followed by PS-1347. Protein yield is a product of protein content and grain dry matter yield. Therefore higher protein yield under modfied land configurations and varieties PS-1225 and PS-1347 could be attributed to higher grain yield and its protein content.

Oil content in grain

An appraisal of the data pertaining to oil content and oil yield of soybean is given in Table 2. The oil contenet did not vary much among land configurations with a range of 19.4% in ridge in furrow system to 19.8% in raised bed sowing. Among varieties also oil content did not differ much. Variety PS-1225 recorded the maximum oil content (19.9%) followed by PS-1092 (19.5%) and PS-1347 (19.4%).

Oil Yield

The oil yield of soybean differed significantly by adopting different land configurations and varieties. Ridge and furrow method was found to produce significantly higher oil yield than other two configurations. Further, raised bed and flatbed methods recorded at par oil yield. Oil yield also differed significantly among varieties. Variety PS-1225 recorded significantly higher oil yield followed by PS-1347. Oil yield is a function of oil content in grain multiplied by grain yield per hectare. As oil content was non-significant in main-plot and sub-plot treatments therefore grain yield was sole factor to determine yield and affected it significantly.

Economics

An appraisal of the data regarding the economic analysis of the experiment is given in Table 2. The cost of cultivation was the highest in case of raised sowing (Rs. 26775/ha) and the lowest in case of flat bed sowing (Rs. 26075/ha). The variation in cost of cultivation was mainly due to cost incurred on land configurations. The gross and net returns were affected significantly both by land configurations and varieties. Ridge and furrow method of sowing recorded significantly the highest gross return, which was higher by 6.6% than raised bed sowing and 8.5% higher than flat sowing (Rs. 53825/ha). There was no significant difference between raised bed and flatbed sowing methods for gross returns. The gross return was the highest with variety PS-1225 (Rs. 62862/ha), which was significantly higher than both remaining varieties. Further variety PS-1347 recorded significantly higher gross return than variety PS-1092 (Rs. 49084/ha). The net return under ridge & furrow sowing was significantly the highest (Rs. 31979/ha). The net return did not differ significantly between raised bed and flatbed sowing methods. Ridge and furrow method of sowing recorded 14.2% higher net return than raised bed sowing and 15.2% higher than flat sowing (Rs. 27750/ha). The B:C ratio was affected significantly due to land configurations as well as varieties. The B:C ratio was significantly the highest in ridge & furrow sowing method (1.21). The B:C ratio did not differ significantly between flat sowing and raised bed sowings. Soybean variety PS-1225 recorded significantly the highest B:C ratio. Further variety PS-1347 recorded significantly higher B:C ratio than variety PS-1092 (0.86).Higher economic returns with ridge & furrow method may be attributed to higher yields with just Rs. 350/ha additional cost. For varieties the cost of cultivation was similar, so variation in economic parameters was largely due to variations in yields.

Conclusion

Quality of soybean was not much affected by varieties and land configuration, however, economically, ridge & furrow method of sowing and variety PS-1225 were found to be better than others but that too without having any interaction among them.

Table 1: Effect of different land configurations and varieties on protein content and yield of soybean

Treatment	Protein content (%)	Protein yield (kg/ha)
Land configurations		
Flat bed	38.8	516.5
Ridge & Furrow	39.1	565.1
Raised bed	38.9	527.3
S.Em±	0.3	7.9
CD at 5%	NS	32.0
Variety		
PS-1092	38.8	469.4
PS-1225	39.2	610.2
PS-1347	38.9	529.2
S.Em±	0.3	12.3
CD at 5%	NS	38.2

Table 2: Effect of different land configurations and varieties on oil content and yield of soybean

Treatment	Oil content (%)	Oil yield (kg/ha)
Land configurations		
Flat bed	19.6	260.2
Ridge & Furrow	19.4	281.7
Raised bed	19.8	267.4
S.Em±	0.2	2.9
CD at 5%	NS	12.0
Variety		
PS-1092	19.5	235.9
PS-1225	19.9	310.1
PS-1347	19.4	263.2
S.Em±	0.2	6.3
CD at 5%	NS	19.7

Table 3: Economic parameters of soybean as affected by land configurations and varieties

Treatment	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
Land configuration				
Flat bed	26075	53825	27750	1.06
Ridge & Furrow	26425	58404	31979	1.21
Raised bed	26775	54756	27981	1.05
S.Em±	-	855	855	0.03
CD at 5%	-	3449	3449	0.13
Variety				
PS-1092	26425	49084	22659	0.86
PS-1225	26425	62862	36437	1.38
PS-1347	26425	55038	28613	1.08
S.Em±	-	1391	1391	0.05
CD at 5%	-	4335	4335	0.16

References

1. Ainsworth EA, Yendrek CR, Skoneczka JA, Long SP. Accelerating yield potential in soybean: potential targets for biotechnological improvement. Plant Cell Environ, 2011. doi: 10.1111/j.1365-3040.2011.02378.x
2. Bhale VM, Patil BK, Farkade BK. Resource conservation technologies to enhance productivity of soybean (*Glycine max*)-*Rabi* sorghum (Sorghum bicolor) sequence. In National symposium on New Paradigms in Agronomic Research, Nov., 19-21, 2008 held at Navsari Agriculture University, Navsari, Gujarat, 2008, 252-253.
3. Chouhan GS. Soybean products and their export potential. Green Farming. 2007; 1(3):55-57.
4. Dubey DP, Dubey Rajiv, Dubey RK. Yield and economics of different soybean varieties under rainfed condition of Madhya Pradesh. Environment and ecology. 2014; 32(2A):664-667.
5. Lakpale R, Tripathi VK. Broad- bed Furrow and Ridge and Furrow Method of Sowing under Different Seed Rates of Soybean (*Glycine Max* L.) for High Rainfall Areas of Chhattisgarh Plains. Soybean Res. 2012; 10:52-59.
6. Pandey IB, Tiwari S, Pandey RK, Kumar R. Effect of bed configuration, fertilizer levels and placement method on the productivity of long duration Pigeon pea [*Cajanus cajan* (L) Millsp] under rainfed condition. J Food Legume. 2014; 27(3):206:209

7. Pawar GR, Pawar HD, Waghmare YM, Chavan DA. Effect of different varieties and plant densities on growth and yield of soybean [*Glycine max* (L.) Merrill]. Soybean Res. 2015; 13(1):89-93.
8. Seyyed Mustafa Sadeghi, Seyyed Ali Noor hosseini Niyaki. Effects of planting date and cultivar on the yield and yield components of soybean in north of Iran. ARPN J of Agricl and Bio. Sci, 2013, 8(1).
9. Sher Singh, Anuradha bhartiya, Bisht JK. Growth, productivity and economics of soybean genotypes under varying planting densities. Soybean Res. 2015; 13(1):82-88.
10. Shinde SH, Thakhur NT, Bhilare RL. Effect of field layout and fertilizer levels on productivity of chickpea. J Maharashtra Agric. Univ. 2000; 25(1):76-77
11. Tomar SS, Dwivedi A, Singh A, Singh MK. Effect of land configuration, nutritional management module and biofertilizer application on performance, productivity and profitability of urdbean [*Vigna mungo* (L.) Hepper], in North-Western India. Legume Res. 2016; 39(5):741-747.