

FORAGE SOYBEAN PERFORMANCE WITH VARIED ROW SPACING AND SEED RATE IN NORTH WESTERN HIMALAYAS

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SUMMARY

Remunerative and higher fodder production is important for livestock production. In this perspective a field experiment was undertaken at Agronomy farm, FoA, Wadura of Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir during *Kharif* 2018 and 2019 to study the influence of row spacing and seed rate on productivity and economics of forage soybean. The experiment comprising of three row spacing (20 cm, 30 cm and 40 cm) and three seed rates (50 kg/ha, 75 kg/ha and 100 kg/ha) laid out in a factorial randomized complete block design with three replications. Row spacing of 30 cm and seed rate of 75 kg/ha recorded higher growth and green fodder production of soybean. The same treatments were also found economically viable in north western Himalayas.

Key words : Forage soybean, row spacing, seed rate, fodder yield and economics

Soybean is mainly cultivated for grain, but is also a productive, high quality annual forage crop. The country faces a net deficit of 35.6% green fodder, 10.95% dry crop residues and 44% concentrate feed ingredients (IGFRI, 2013). In Jammu & Kashmir, 0.6 lakh ha is under cultivated fodder crops and faces a net deficit of 19% in fodder (Raja, 2013). Maize is one of the important cash crops grown for green cobs in Jammu and Kashmir. The farmers generally grow early maize crop (April) to fetch higher market price. The maize crop is harvested in the second fortnight of July. To grow another crop after the maize there is limited options as only two and half month of growing season remains in Kashmir. Forage soybean being short duration (60 to 65 days) crop fits well in the cropping sequence (Maize-forage soybean). However there is no information available about the seed rate and spacing to be followed for higher forage production. Keeping these aspects in view, a field experiment was conducted to evaluate the performance of forage soybean under varied row spacing and seed rate.

MATERIALS AND METHODS

Field experiments were conducted during

kharif 2018 & 2019 at Faculty of Agriculture Wadura, Sher-e-Kashmir University of Agricultural Science and technology, Kashmir to find out the suitable row spacing and seed rate of forage soybean for higher fodder production and economic viability. The experimental design was factorial randomized complete block with three replications. The first factor was density with three spacing (20 cm, 30 cm and 40 cm) and second factor was seed rate with three levels (50 kg/ha, 75kg/ha and 100 kg/ha). The study area falls in North Western Himalayan zone. The weekly weather data is given in Table 1. The soil of experimental field was clay loam in texture, high in organic carbon (2.1%), medium in available phosphorus (11.7 kg/ha), available potassium (306 kg/ha) and low in available nitrogen (147 kg/ha). The sowings of the experiments were done on 16 July 2018, 25 July 2019 and harvestings were done on 22 September 2018 and 30 September 2019, respectively. 'Shalimar soybean-1' variety of soybean was sown as per the treatments during both years of investigation. For dry matter accumulation the samples were taken at the time of harvest and dried in shade, then oven dried at 60^o C for 72 hours. Samples were weighed to a constant weight and dry matter was expressed as tonnes/ha. For economic

analysis (benefit cost ratio) cost of inputs and price of outputs were calculated at prevailing market price.

RESULT AND DISCUSSION

Plant height and dry matter accumulation

In general the growth characters (plant height and dry matter accumulation) were higher in 2019 compared to 2018. The higher growth characters in 2019 may be due to higher mean maximum temperature and lower mean minimum temperature compared to year 2018 (Table 1). The row spacing induced significant variation in crop growth characters (Table 2). The row spacing of 20 cm recorded significantly higher growth characters (plant height and dry matter accumulation) than 40 cm spacing, but was at par to row spacing of 30 cm in both years (2018 and 2019). Further, the 30 cm spacing recorded significantly higher plant height and dry matter accumulation than 40 cm spacing. Higher growth characters with closer row spacing were attributed to efficient utilization of available resources (nutrients, water and solar radiation) compared wider spacing (40 cm). Similar finding were also reported by Naoki *et al.*, (2018), Acikgoz *et al.*, (2007) and Weris, (1983). The variable seed rate also induced significant difference in growth character of soybean (Table 2). The seed rate of 100 kg/ha recorded significantly higher plant height and dry matter accumulation of forage soybean during 2018 and 2019 than 50 kg/ha, however, was not statistically superior to seed rate of 75 kg/ha. Further, the 75 kg/ha seed rate recorded significantly higher green fodder

yield than 50 kg/ha seed rate. The taller plants of soybean with higher seed rate may be attributed to more number of plants per unit area. That increased the competition of plants for available resources especially solar radiation and resulted in taller plants. Findings are close to those reported by Naoki *et al.*, (2018). The higher dry matter accumulation of forage soybean was due taller plants and more number of plants per unit area with higher seed rate compared to lower seed rate treatments. The results were in close conformity with Acikgoz *et al.*, (2007).

Green fodder yield and economics

Significantly higher green fodder yield was observed with 20 cm row spacing compared to 40 cm row spacing (Table 3). However, 20 cm row spacing produced marginally higher green fodder yield than row spacing of 30 cm in both years (2018 and 2019). In turn, row spacing of 30 cm produced significantly higher green fodder yield of soybean compared to 40 cm row spacing. Taller plant and higher dry matter accumulation are the reason for production of higher green fodder yield with closer spacing compared to wider spacing. Rehman and Hussain (2011) also recorded similar trend in stover yield of soybean with higher plant population per unit area. Data presented in Table 3 revealed that the 30 cm row spacing was superior in B:C (2.24 and 3.28) during both years (2018 and 2019) compared to 20 cm row spacing and 40 cm row spacing. Higher benefit cost ratio in 30 cm row spacing is due to higher green fodder production than 40 cm row spacing and

TABLE 1
Mean weekly weather parameters during the crop growth period (2018 and 2019)

Standard week	Temperature (°C)				Rainfall (mm)	
	Max		Min.		2018	2019
	2018	2019	2018	2019		
1	30.40	28.02	17.72	17.77	6.00	49.00
2	28.07	30.77	16.63	17.24	41.50	3.70
3	30.49	33.16	14.03	17.90	6.20	23.40
4	30.67	31.80	17.33	17.04	28.20	13.90
5	30.97	29.91	17.40	12.93	22.60	0.00
6	31.91	30.29	16.86	14.96	0.00	0.00
7	31.89	32.70	15.06	15.04	0.00	0.00
8	30.30	32.41	14.11	9.54	0.00	0.00
9	29.53	31.40	11.46	9.40	10.30	0.00
10	28.30	30.09	8.16	12.89	3.40	8.60
Mean	30.25	31.05	14.87	14.47	118.2	98.6

TABLE 2
Influence of row spacing and seed rate on plant height and dry matter accumulation of soybean.

Treatment	Plant height at harvest (cm)		Dry matter (t/ha)	
	2018	2019	2018	2019
Spacing (cm)				
20	45.7	57.2	5.62	7.73
30	43.2	56.1	5.24	7.45
40	37.5	51.1	3.45	5.95
S. Em±	1.31	0.64	0.25	0.28
C. D. (P<0.05)	3.47	1.92	0.79	0.61
Seed rate (kg/ha)				
50	38.4	50.7	4.29	6.43
75	42.6	55.8	5.15	7.23
100	43.1	57.7	5.21	7.48
S. Em±	1.31	0.64	0.25	0.28
C. D. (P<0.05)	3.47	1.92	0.79	0.61

TABLE 3
Influence of row spacing and seed rate on green fodder yield and benefit cost ratio forage soybean.

Treatment	Green fodder yield (t/ha)		B : C	
	2018	2019	2018	2019
Spacing (cm)				
20	19.4	28.7	2.14	3.17
30	18.8	27.5	2.24	3.28
40	12.7	22.1	1.58	2.75
S. Em±	0.52	0.75	-	-
C. D. (P<0.05)	1.55	2.26	-	-
Seed rate (kg/ha)				
50	14.8	23.83	1.77	2.84
75	17.6	26.77	2.04	3.07
100	18.5	27.70	2.02	3.06
S. Em±	0.52	0.75	-	-
C. D. (P<0.05)	1.55	2.26	-	-

lower cost of cultivation than 20 cm row spacing. Seed rate of 75 kg/ha recorded higher B:C (2.04 and 3.07) compared to seed rate of 50 kg/ha and 100 kg/ha. This may be attributed higher green fodder production with 75 kg/ha seed rate compare to 50 kg/ha seed rate and lower cost of cultivation than 100 kg seed rate.

CONCLUSION

The study revealed that closer row spacing was superior in production of higher green fodder yield compare to wider row spacing. Similarly higher seed rate recorded more green fodder productivity of soybean than lower seed rates. The benefit cost ratio was also found higher with row spacing 30 cm and seed rate of 75 kg/ha. From the data interpretation of the investigation, it may be concluded that spacing of 30 cm row to row and seed rate of 75 kg/ha were suitable economically as well as in terms of higher green fodder productivity of forage soybean in north western Himalayas.



Picture 1. Harvesting and data collection in one of the replication of forage soybean trial.

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