

PLANTING GEOMETRY SIMULATION FOR GRASS-LEGUME INTERCROPPING IN THE ARID ZONE

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In traditional range lands and pastures, of arid zone, introduction of legumes has not proved to be much successful since the grasses tend to be more competitive. However, alteration in allocation of space to component crops, through some degree of spatial arrangement, causes appreciable increase in the yield of legume component and that of base crop has been reported by Talamucci (1975). It is obvious that introduction of legumes will improve the forage quality due to greater protein turnover. There are also evidences that quality of mixture increased with increase in legume proportion in mixtures (Pop, 1979). These results warranted a study to find out suitable planting geometry and to optimize grass to legume ratio in order to get higher tonnage and fodder of good quality.

A field experiment was conducted at Central Arid Zone Research Institute, Jodhpur during 1981 on a loamy sand soil. Total rainfall during the growing season was 246 mm against the normal 367 mm. The distribution of rainfall was erratic. The experiment consisted of two treatments of pure grass (*Cenchrus ciliaris* Linn.) grown in regular row (60x60 cm) and paired row system (30x60/90 cm) and ten intercropping treatments of grass and legume (*Dolichos lablab* var. *Lignosus*, strain No. 144) ratios (Table 1). *C. ciliaris* CAZRI 358 was sown in spots with a seed rate of 4 kg/ha. The experiment was conducted in a randomised block design with 3 replications. Three cuttings of grass and one cutting of legume at 50% flowering were taken in a year. The produce of the three cuttings of grass was pooled for chemical analyses. For estimating crude protein content of the produce, the grass and legume components were mixed in proportion to their dry matter production.

The yields of pure grass under regular row system (60 x 60 cm) and paired row system (30 x 60/90 cm) did not differ significantly (Table 1). This suggests that inter-row spacing of grass could be reduced upto 30 cm in paired row planting system as against the standard spacing of 60 cm, without affecting the yield. The space so created in between two pairs could be used for legume intercrop. Growing of legume in between two pairs did not affect the yield of grass significantly upto the paired row spacing of 30 x 60/90 cm. The highest yield of 26 q/ha was recorded in the system having 30 cm inter-row, 40 cm inter-row and 90 cm inter-pair spacing. Further increase in spacing decreased the total yield. The contribution of legume increased with increasing the area under legume and the highest contribution (4 q/ha)

Table 1. Dry forage yield (q/ha) and crude protein content (%) of *C. ciliaris* in pure and grass-legume mixture

*Treatment	Dry forage yield			Crude protein
	Grass	<i>D. lablab</i>	Grass + <i>D. lablab</i>	
Grass RR (60 x 60)	23.88	—	23.88	10.43
Grass DR (30 x 60/90)	22.88	—	22.88	10.60
Grass (30 x 60/90) + one row of <i>D. lablab</i>	22.16	1.50	23.66	11.27
Grass (30 x 40/90) + two rows of <i>D. lablab</i>	25.61	1.70	27.31	12.10
Grass (30 x 60/90) + two rows of <i>D. lablab</i>	22.61	1.66	24.28	12.27
Grass (30 x 80/90) + two rows of <i>D. lablab</i>	20.45	1.80	22.25	12.12
Grass (45 x 40/135) + three rows of <i>D. lablab</i>	20.74	2.45	23.19	12.97
Grass (45 x 60/135) + three rows of <i>D. lablab</i>	17.97	2.75	20.69	13.07
Grass (45 x 80/135) + three rows of <i>D. lablab</i>	16.80	2.86	19.66	13.08
Grass (60 x 40/180) + Four rows of <i>D. lablab</i>	16.30	3.60	19.98	13.37
Grass (60 x 60/180) + Four rows of <i>D. lablab</i>	14.22	4.00	18.22	13.57
Grass (60 x 80/180) + Four rows of <i>D. lablab</i>	12.42	3.85	16.27	13.43
CD 5%	1.72		1.81	0.76

* RR = Regular row DR = Double row

was obtained when four rows of *D. lablab* were grown in between two pairs (60 x 60/180 cm).

The combined yields of grass and legume followed a trend similar to that of grass in different planting systems. The system of 30 x 40/90 cm again gave significantly highest yield.

There were significant differences among treatments for crude protein content (Table 1). The crude protein content improved with the increase in the proportion of legume in the mixture. The highest protein content (13.57%) was obtained from the system having 60 x 60/180 cm spacings.

The study thus suggests that in the establishment year if the objective is to take full yield of grass and a bonus yield of legume, planting geometry of 30 x 40/90 cm is adequate. However, if greater proportion of legumes is required to further improve the forage quality, the geometry of 60 x 60/180 cm with four lines of *D. lablab* can be practiced with advantage.

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