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Estimation of optimum size and shape of plot for field experiments on fenugreek (*Trigonella foenum graecum*)

R. I. PRAJAPATI[1*], G. K. CHAUDHARY[2] AND J. M. LORIA[3]

College of Horticulture,
S. D. Agricultural University, Jagudan- 384 490 (Gujarat)

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ABSTRACT

The optimum plot size for field experimentation on fenugreek crop was worked out using uniformity trial data. The popular methods *viz.,* maximum curvature was used for the purpose. One basic unit was fixed by taking 3 rows each of 1 meter length. A plot of 16 basic units size with shape of 12 rows each of 4 meters length (3.6 m × 4.0 m = 14.4 m^2) was found as optimum plot size for field experiments on fenugreek.

Key words: Optimum plot size, coefficient of variation, fenugreek

Agricultural research workers are mainly concerned with field experimentation. Efficient planning of precise field experiments largely depends on the nature of experiments, variability present in experimental materials and the cost of various operations as well as the materials involved in conducting the experiment. Each experimental site has an inherent variation i.e. soil variability which could be accessed through uniformity trial. The studies of such variation help in proper choice in size and shape of plots and blocks, experimental design and number of replications etc. Such studies based on uniformity trials in Indian conditions were undertaken with various annual crops like Bajra (Patel and Patel, 1967); Paddy (Agrawal and Deshpande, 1967), Tobacco (Prajapati and Patel, 1984), Wheat (Kumar and Singh,1986), Mungbean (Singh and Singh, 1989) and mustard (Prajapati *et al.*, 2013). However there is no information on optimum size and shape of plot for fenugreek which is an important cash crop of North Gujarat. Therefore, the uniformity trial on fenugreek crop was conducted.

[1]Assistant Professor, College of Horticulture, Jagudan,
[2]Associate Professor, [3]Statistical Assistant, Department of Agricultural Statistics, C P College of Agriculture, S D Agricultural University, Sardarkrushinagar
*Email:ri_prajapati@yahoo.in

MATERIALS AND METHODS

The popular and high yielding variety GM 2 was sown at a spacing of 30 cm between two rows covering an area of about 0.40 hectare. The other crop cultivation practices in vogue were followed. A block of 20 m x 18 m was harvested and yield data were recorded separately for 400 basic units. The dimension of one basic unit was three rows of one meter length (0.9 m^2). Border areas were excluded from each side of experimental plot. The different sized plots of size 1, 2, 4, 5, 8, 10, 16,20, 25, 40, 50, 80 and 100 were formed by combining neighbouring units both length-wise as well as width-wise. The coefficient of variation (C.V.) for different combinations of above sized plots was calculated separately using seed yield data as under.

$$C.V.\% = \frac{\text{Standard Deviation}}{\text{General Mean}} \times 100$$

The optimum plot size was determined using maximum curvature method (Federer, 1955).

RESULTS AND DISCUSSION

The comparisons were made among different sizes and shapes of plots using C.V. % obtained for yield of fenugreek. The results are given in Table 1 and depicted by Fig. 1. The results revealed that the coefficient of variation (C.V. %) decreased with increase in plot size. The average C.V. per cent decreased from 15.79 per cent to to 1.51per cent with increase in plot size from 1 unit to 100 units. Initially the decrease in C.V. per cent was more rapid but after 10 units plot size the reduction was marginal. These results are in agreement with the results reported by Patel and Patel for Bajra (1967); Prajapati and Patel for bidi tobacco (1984); Kumar and Singh for wheat (1986); Naliyadara *et al.* for groundnut (2013); Prajapati *et al.* for mustard (2013) and Chaudhary *et al.* for mothbean (2017).

Table 1 C. V. per cent per unit size for seed yield of fenugreek

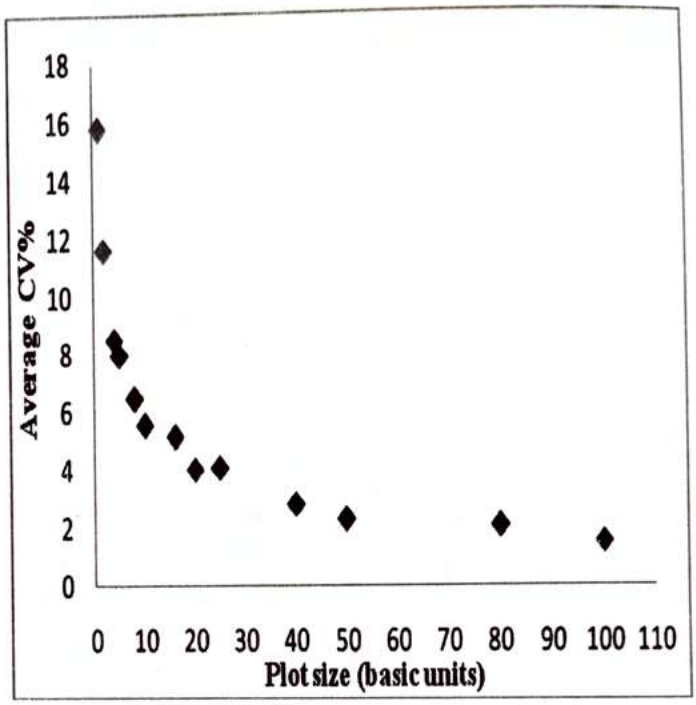
No. of basic unit	Combinations	C. V. %	Average C.V. % Per unit
1	1x1	15.79	15.79
2	2x1	11.68	11.63
	1x2	11.59	
4	4x1	8.32	8.53
	2x2	8.40	
	1x4	8.86	
5	5x1	8.00	8.01
	1x5	8.02	
8	4x2	6.30	6.50
	2x4	6.70	
10	10x1	5.50	5.58
	5x2	5.96	
	2x5	5.80	
	1x10	5.06	
16	4x4	5.15	5.15
20	20x1	3.99	4.04
	10x2	4.12	
	5x4	4.52	
	4x5	4.41	
	2x10	3.59	
	1x20	3.61	
25	5x5	4.10	4.10
40	20x2	3.34	2.85
	10x4	3.05	
	4x10	2.37	
	2x20	2.65	
50	10x5	2.48	2.28
	5x10	2.08	
80	20x4	2.31	2.06
	4x20	1.81	
100	20x5	1.81	1.51
	10x10	0.97	
	5x20	1.76	

The difference between C.V. per cent of the consecutive points (plot size) may help to estimate per unit decrease in C.V. per cent and thereby point of maximum curvature. The results are given in Table 2. The per unit decrease in C.V. per cent was observed from 4.16 per cent to 0.03 per cent with increase in plot size from 2 units to 100 units plot size. Further look into the data clearly indicated that the reduction in C.V. was more rapid in the beginning i.e. up to 10 basic units and then after it decreased marginally. Thus, reduction in C.V. was not proportional when plot size increased beyond 10 basic units. The same results graphically presented in Fig. 1 showed the curvature more clearly. Therefore, 10 basic units plot size could be taken as point of maximum curvature (Federer, 1955). The optimum plot size 16 basic units is that value of the size of the plot, which lies just beyond the point of maximum curvature and appeared to be optimum plot size for field experiments on fenugreek crop.

Table 2 Per unit decrease in C. V. % for seed yield of Fenugreek.

Plot size in basic unit	Average C.V. %	Difference in C.V. %	Per unit decrease In C.V. %
1	15.79		
2	11.63	4.16	4.16
4	8.53	3.10	1.55
5	8.01	0.52	0.5 2
8	6.50	1.51	0.50
10	5.58	0.92	0.46
16	5.15	0.43	0.07
20	4.04	1.11	0.28
25	4.10	-0.06	0.01
40	2.85	1.25	0.08
50	2.28	0.57	0.06
80	2.06	0.22	0.01
100	1.51	0.55	0.03

Fig 1 Coefficient of variation in per cent for different sized plots



CONCLUSION

A plot of 16 basic unit size having shape of 12 rows each of 4 meters length (3.6 m × 4 m=14.4 m^2) was found as optimum plot size for field experiments on fenugreek.

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