GAU Research Journal **42** (2) : 98-101 (July 2017)

Plot size study from uniformity trial data of mothbean (*Vigna aconitifolia*)

G. K. CHAUDHARY[1], M. K. CHAUDHARI[2] AND B. H. PRAJAPATI[3]

Department of Agril Statistics C. P. College of Agriculture
S. D. Agricultural University Sardarkrushinagar-385 506 (Gujarat)

Received : 27 January, 2017

ABSTRACT

An uniformity trial on Mothbean crop was carried out at Main Pulses Research Station, S. D. Agricultural University Sardarkrushinagar to find out optimum plot size and number of replications. Maximum curvature method and Fair field Smith variance method were used for this purpose. Based on coefficient of variation (CV) values, a plot of 16 basic units size with shape of 8 rows each of 4.00 meter length (4.00 m.× 3.60 m. = 14.40 m^2) was considered optimum plot size (net plot) with 4 minimum replications for field experiments on mothbean crop at Sardarkrushinagar location (Gujarat).

Key words: variability, plotsize, replications

Agricultural research workers are mainly concerned with field experimentation. Efficient planning of precise field experiments largely depends on adoption of principles of experimental design (Replication, Randomization and Local control), choice of experimental design and suitable size and shape of plot. Each experimental site has an inherent variation i.e. soil variability could be assessed 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 Singh1986), Mungbean (Singh and Singh, 1989) and mustard (Prajapati *et al.*, 1993). However there is no information on optimum size and shape of plot for mothbean as an important pulse crop of North Gujarat. It is widely used as the main source of protein and calories as well as fodder for animals. The uniformity trial, therefore, was conducted on mothbean crop.

MATERIALS AND METHODS

The popular and high yielding variety Mothbean-3 was sown at a spacing of 45 cm between two rows covering an area of about 0.036 hectare. The other crop cultivation practices in vogue were followed. A block of 20 m. x 18 m. was harvested and seed yield data were recorded separately for 400 basic units. The dimension of each 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, 25 and 40 were formed by combining neighbouring units both length-wise as well as width-wise. The coefficient of variation 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) and Fair-field Smith's variance law (Smith, 1938). The minimum number of replications (r) and area required for 5 % standard error of mean (S.Em.) for different plot size were calculated as per (Nigam and Gupta, 1997) using the formula as r = (C.V. %)^2 / (5 % SEm)^2. The relative land use efficiency was also calculated for different plot sizes.

RESULTS AND DISCUSSION

The comparisons were made among different sizes and shapes of plots using C.V. % obtained for seed

[1]Assistant Professor, [2]Assistant Professor, Aspee College of Home Science and Nutrition, [3]Professor and Head

yield of mothbean. The results presented in Table 1 revealed that the coefficient of variation (C.V. %) decreased with increase in plot size. The average C.V. % decreased from 21.87 % to to 8.41 % with increase in plot size from 1 unit to 40 units. Initially the decrease in C.V. % was more rapid but after 16 units plot size the reduction was marginal. These results are in agreement with the results reported by Kumar and Singh (1986), Prajapati *et al.*, (1993), Prajapati *et al.*, for bidi tobacco (1984) and Patel and Patel (1967) for Bajra.

The difference between in C.V. % of the consecutive points (plot size) may help to estimate per unit decrease in C.V. % thereby point of maximum curvature. The results are given in Table 2. The per unit decrease in C.V. % (Table 2) was observed from 4.97 % to 0.05 % with increase in plot size from 2 units to 40 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 16 basic units and then it decreased marginally. Thus, reduction in C.V. was not proportional when plot size increased beyond 16 basic units. Therefore, 16 basic units plot size could be taken as point of maximum curvature (Federer 1955) and appeared to be optimum plot size for field experiments on mothbean crop.

The number of replication and required area for different plot size at 5 % standard error of mean were compare from the estimated C.V. % for seed yield of mothbean by using the formula (Nigam and Gupta, 1979). The results are shown in Table 3 revealed that the number of replication and relative land use efficiency decreased as the size of plot increased. Agricultural operation in field experiment with smaller plot size, a

Table 1 C. V. % per unit size for seed yield of mothbean

No. of units	Combinations	C. V. %	Average C.V. % Per unit
1	1x1	21.87	21.87
2	1x2	16.79	16.9
	2x1	17.01	
4	1x4	14.15	13.79
	2x2	13.52	
	4x1	13.70	
5	1x5	13.01	12.28
	5x1	11.55	
8	2x4	11.91	11.67
	4x2	11.43	
10	1x10	11.12	10.45
	2x5	11.19	
	5x2	10.26	
	10x1	9.24	
16	4x4	10.40	10.40
20	2x10	10.09	9.37
	4x5	9.98	
	5x4	9.39	
	10x2	8.00	
25	5x5	9.18	9.18
40	4x10	9.38	8.41
	10x4	7.44	

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

Plot size in basic unit	Average C.V. %	Difference in C.V. %	Per unit decreaseln C.V. %
1	21.87	-	-
2	16.90	4.97	4.970
4	13.79	3.11	1.555
5	12.28	0.91	0.910
8	11.67	0.61	0.203
10	10.45	1.22	0.610
16	10.40	0.05	0.008
20	9.37	1.03	0.258
25	9.18	0.19	0.038
40	8.41	0.77	0.051

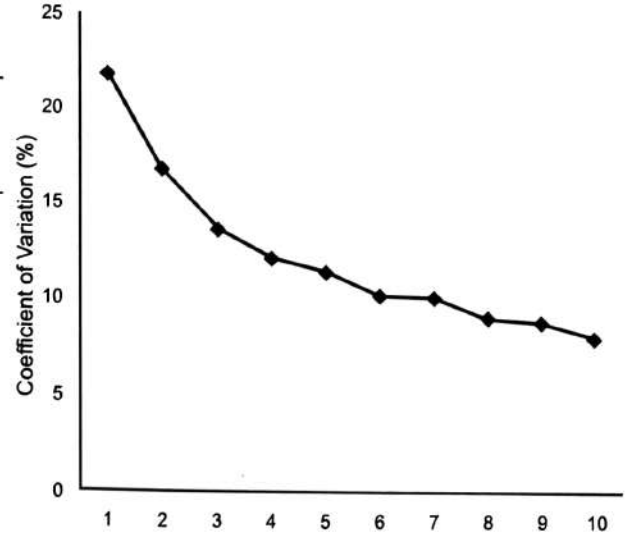

Fig. Coefficient of variation in per cent for different sized plots

Table 3 Number of replications and area required for 5 per cent S. Em. and relative land use efficiency for seed yield with respect to unit plot size.

No. of basic unit plot size	C.V. %	No. of replications	Area required		Relative land use (%) efficiency
			No. of basic units	Sq. m.	
1	21.87	19	19	17.1	100.00
2	16.90	11	22	19.8	86.39
4	13.79	8	32	28.8	59.38
5	12.28	6	30	27.0	63.33
8	11.67	5	40	36.0	47.50
10	10.45	4	40	36.0	47.50
16	10.40	4	64	57.6	29.69
20	9.37	4	80	72.0	23.75
25	9.18	3	75	67.5	25.33
40	8.41	3	120	108.0	15.83

plot size having relatively high land use efficiency with less number of replications should be considered for field experimentation. Such situation was observed with the 16 units plot size which is having considerably less number of replications and relatively high land use efficiency (Table 3) for seed yield. Therefore, 4 replications could be considered optimum for 16 units plot size at 5 % probability level for mothbean crop.

CONCLUSION

A plot of 16 basic units size having shape of 8 rows each of 4 meters length (4 m × 3.6 m) was found as optimum plot size (net plot) with 4 replications for field experiments on mothbean at Main Pulses Research Station, S.D. Agricultural University Sardarkrushinagar.

REFRENCES

Agrawal, K. N. and Deshpande, M. R. 1967. Size and shape of plots and blocks in field experiments with dibbled paddy. *Indian Journal of Agricultural Science,* **37** (6) : 445-55.

Federer, W. T. 1955. Experimental design, theory and application. Mac Millan Co., New York 2nd ed., p. 58.

Kumar, P.R. and Singh, N.P. 1986. Analysis of Uniformity trial data with wheat. *Journal of Indian Society of Agricultural Statistics*, **38** (3):310.

Nigam, A. K. and Gupta, V. K. 1979. *Handbook on Analysis of Agricultural Experiments, 1st edn.,* IASRI Publication, New Delhi, pp.3

Patel, N.M. and Patel R.M. 1967. Plot technique in Bajri. B.A.College of Agriculture, GAU.*p.*89-97

Prajapati, B. H. and Patel, N. M. 1984. Estimate of optimum plot size uniformity data of bidi tobacco. *GAU Research Journal,* **9** (2) : 36-39.

Prajapati, B. H., Khatri, T. J., Upadhyay, S. M. and Fougat, R. S. 1993. Estimate of optimum plot size from uniformity data of mustard. *GAU Research Journal,* **18** (2) : 35-39.

Singh, H. P. and Singh, D. P. 1989. Optimum plot size for field experiment in mungbean. Narendra *Deva Journal of Agricutural Research,* **4** (1) : 61-64.

Smith, H. F. 1938. An empirical law describing heterogeneity in the yields of agricultural crops. *Indian Journal of Agricultural Science,* **28** : 1-23