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Field plot technique studies in castor

S. M. Upadhyay, H. R. Pandya and A. D. Kalola

Department of Agricultural Statastics,
College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat).

Abstract

Optimum size and shape of plot has been worked out from uniformity trail on castor (variety GCH-6) at Dry Farming Research Station, Junagadh Agricultural University, Jamkhambhalia during *kharif*- 2003. The seed yield data of 1200 plots (basic unit 0.90 m x 0.90 m) were recorded and analyzed to find out the optimum size and shape of the plot using maximum curvature method. The results revealed that coefficient of variation (CV %) per unit area decreased with the increase in size of plot. It could be concluded that the plot size of 15 basic unit (i.e. 4.5 m x 2.7 m = 12.15 sq. m.) consisting of three rows and five plants in each row as the optimum plot size for conducting field experiment in castor at Jamkhambhalia. For the yield data, the value of b, Smith's coefficient of heterogeneity, varied from 0.57 to 0.92 for different plot size. The equation obtained was $Y= 43.47 X^{-0.3889}$. The R^2 between plot size and CV was computed as 0.9537.

Keywords : Field plot techniques, uniformity trial, castor

Introduction

In agricultural research, efficient planning of field experiments apart from other consideration like randomization, replication and local control, also depends upon suitable size and' shape of plot. Each experimental site has an inherent variation i.e. soil variability which could be assessed through uniformity trial. The study on such variation helps in proper choice of size / 15 and shape of plots and blocks, experimental design, number of replications etc. Such studies t based on uniformity trials under Indian conditions were undertaken with various annual crops like Bajra (1), Tobacco (2), Sorghum (3), Mungbean (4), Paddy (5) and Potato (6). However, there is no Information on optimum plot size for castor, for dry farming of North Saurashtra, being predominantly rainfed castor growing area. Castor being an important oilseed crop. The field experiment (Uniformity trial, was therefore, conducted on castor crop at the Dry Farming Research Station (DFRS), Junagadh Agricultural University, Jamkhambhalia during *kharif* season of 2003.

Material and methods

The most popular castor variety GCH - 6 was raised at a spacing of 90 c.m. x 45 c.m. covering an area of 0.15 hectare. All the recommended practices in vogue were followed. A block of 40 rows of 27 meter length was harvested and seed yield data were obtained separately for 1200 basic units. The dimension of each basic unit was one row of 0.90 meter length. The dimension of the smallest unit was 0.90 m length and 0.90 m width (0.81 sq m). Contiguous plots were then combined in 56 different combinations and the different sized plots of size 1, 2, 3, 4, 5, 6, 10, 12, 15, 16, 20, 24, 30,40, 50, 60, 80, 100, 120, 152, 200, 240, 300 and 600 units were formed by combining neighboring units both length wise and width wise. Maximum curvature method (7) was employed to investigate the optimum plot size and shape for *kharif* castor (Cv. GCH - 6).

Maximum curvature method involves plotting a curve of the C.V. per cent per unit area against plot size. Therefore, C.V. per cent per unit area was estimated for various sized plots. These C.V. per cent are termed as un-adjusted C.V. per cent.

Results and discussion

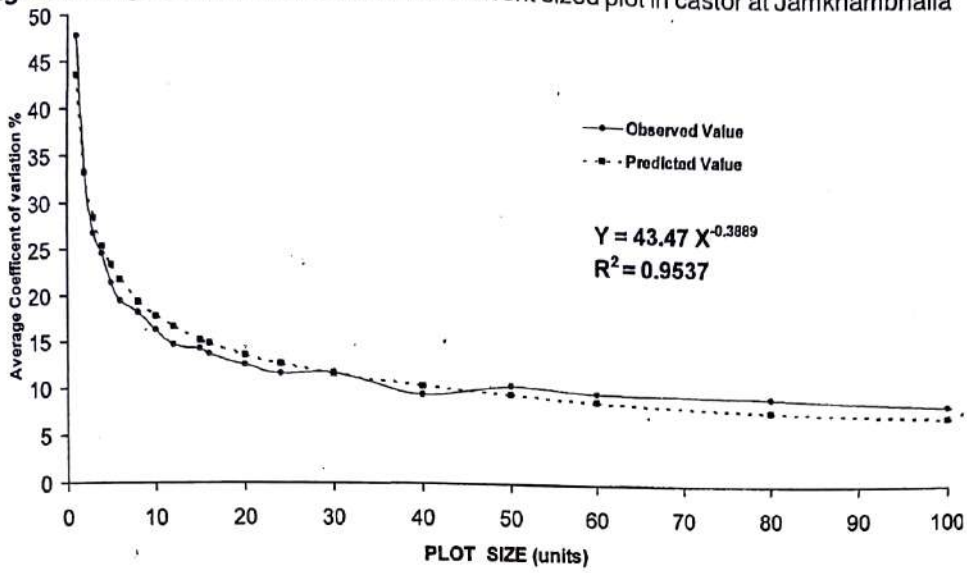
The comparisons were made among different sizes and shapes of plots using C.V.%. The C.V.% decreased steadily either with increase in length of the row or an increase in the number of rows (Table 1 and Fig. 1). The decrease in the C.V.% with an increase in the plot size is in agreement with the finding of Patel and Patel (1) in Bajra, Prajapati *et al.* (8), in Mustard, Upadhyay *et al.* (5) in Paddy and Bhatt *et al.* (6) in potato.

Table 1. Coefficient of variation (CV) in percentage, Difference in CV, Per unit decrease in CV and Soil heterogeneity index for different sizes and shapes of plots for seed yield in castor at DFRS,Jamkhambhalia.

Plot size	Shape basic unit (LxW)	Variance	Coefficient of Variation %		Difference In CV%*	Per unit decrease In CV %	Soli heterogeneity In Index (b)	
			Plot	Mean			Plot	Mean
1	1 x 1	12625	47.67	47.67	--	--	--	--
2	2 x 1	29935	34.10	33.28			0.75	0.82
3	1 x 2	27116	32.46		14.39	14.39	0.90	
	1 x 3	41197	26.67	26.67			0.92	0.92
4	4 x 1	65180	25.16	24.51	6.61	6.61	0.82	0.86
	2 x 2	58567	23.85		2.16	2.16	0.89	
5	5 x 1	82942	22.71	21.42			0.83	0.90
	1 x 5	65203	20.13		3.09	3.09	0.98	
6	2 x 3	98435	20.61	19.43			0.85	0.92
	1 x 6	77033	18.24		1.99	1.99	0.99	
8	8 x 1	137638	18.28	18.20			0.85	0.86
	4 x 2	135398	18.13		1.23	0.62	0.86	
10	10 x 1	189863	17.17	16.27			0.82	0.87
	5 x 2	191361	17.24		1.93	0.97	0.82	
	2 x 5	157891	15.66				0.90	
	1 x 10	144669	14.99				0.94	
12	4 x 3	218772	15.37	14.70			0.85	0.89
	2 x 6	182127	14.02		1.57	0.79	0.93	
15	5 x 3	312743	14.69	14.16			0.81	0.84
	1 x 15	268268	13.61		0.54	0.18	0.87	
16	8 x 2	308502	13.69	13.69			0.85	0.85
20	20 x 1	398331	12.44	12.48	0.47	0.47	0.85	0.85
	10 x 2	433784	12.98		1.21	0.30	0.82	
	4 x 5	383195	12.20				0.86	
	2 x 10	389597	12.30				0.86	
24	8 x 3	473802	11.30	11.55			0.86	0.85
	4 x 6	514595	11.78		0.93	0.23	0.83	
30	10 x 3	702834	11.02	11.66			0.82	0.78
	5 x 6	820242	11.90		-0.11	-0.02	0.77	
	2 x 15	761364	11.47				0.79	
	1 x 30	870486	12.26				0.76	
40	40 x 1	557931	7.36	9.39			0.97	0.84
	20 x 2	947381	9.59		2.27	0.23	0.83	
	8 x 5	1012245	9.91				0.81	
	4 x 10	1182699	10.72	10.47			0.77	
50	10 x 5	1516000	9.71		-1.08	-0.11	0.78	0.74
	5 x 10	2030300	11.24				0.70	
60	20 x 3	1657896	8.46	9.80	0.67	0.07	0.81	0.73
	10 x 6	2216856	9.78				0.74	
	4 x 15	2355696	10.08				0.72	
	2 x 30	2748648	10.89				0.69	
80	8 x 10	3653590	9.42	9.42			0.71	0.71
100	20 x 5	3699933	7.58	8.48	0.38	0.02	0.77	0.72
	10 x 10	5661067	9.38		0.94	0.05	0.67	
120	40 x 3	924000	6.16	7.49			0.81	0.72
	20 x 6	5582400	7.76		0.99	0.05	0.73	
	8 x 15	7656768	9.09				0.66	
	4 x 30	9195168	9.96				0.62	0.78
150	10 x 15	12145500	9.16	9.81			0.63	0.60
	5 x 30	15847050	10.46		-2.32	0.08	0.58	
200	20 x 10	13968000	7.37	7.37			0.68	0.68
240	8 x 30	29996160	8.99	8.99	2.45	0.05	0.58	0.58
300	20 x 15	30498600	7.26	8.17	-1.63	-0.04	0.63	0.59
	10 x 30	47700600	9.08		0.82	0.01	0.56	
600	40 x 15	8640000	6.19	6.71			0.57	0.57
	20 x 30	120933600	7.23		1.46	0.00	0.57	

* Of consecutive values given in column 5

Fig. 1. Average coefficient of variation for different sized plot in castor at Jamkhambhalia



The average C.V. % with different plot sizes (Table 1) showed that the coefficient of variation decreased with the increase in the plot size. It can be seen from Fig. 1 that the C.V. decreased as the size of the plot increased up to 15 basic units, thereafter the decrease in C.V. was marginal and hence the optimum plot size was estimated at 15 times the basic units. The differences among C.V. (Table 1) for the plots of the same size in different shapes were in general low. From the data (Table 1), it could be concluded that the plot size of 15 basic units (i.e. 4.5 m x 2.7 m = 12.15 sq. m.) consisting of three rows and five plants in each row with an area of 12.15 sq. m. as the optimum plot size for conducting field experiments in castor at Jamkhambhalia.

For the yield data, the value of b, Smith's coefficient of heterogeneity, varied from 0.57 to 0.92 for different plot sizes (Table 1). The C.V. % for different plot sizes was found to follow closely with Smith's model. The equation obtained was Y =43.47 X-O.3889 (Fig. 1). The R2 between plot size and C.V. was I computed as 0.9537.

The rate of reduction in C.V. % was more with the increase in width of the plot (I.e. number of rows) than that with the increase in length of the plot (Table - 1). In fact such plots are (dimension wise) long and narrow plots.

The per unit decrease in C.V.% (Table - 1) for different plots sizes estimated from the differences between C.V.% of consecutive points indicated that the effective decrease in C. V. % due to increase in plot size was up to 15 units sized plot. The graphical presentation of C.V. % (Figure - 1) also revealed similar trend. Therefore, 15 units size I.e. 12.15 sq. m. size could be considered as an optimum plot size.

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