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# UTLIZATION OF UNIFORMITY TRIALS TO ESTIMATE THE OPTIMUM PLOT SIZE AND SHAPE AND THE NUMBER OF REPLICATIONS IN WHEAT YIELD TRIALS

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## ABSTRACT

In the present work, two uniformity trials were carried out during the first and the second winter seasons of 2011/2012 and 2012/2013 in the Experimental farm Demo, Faculty of Agriculture, Fayoum University. The main objectives were to estimate the optimum plot size, plot shape and number of replicates for wheat yield traits using the variety Sakha 93 as plant material. The cultivated area of each field trial was divided into 12 strips; each of which consisted of 100 rows, 0.2 m width and 3.0 m long. Two statistical methods including soil variability index and maximum curvature were used to estimate the optimum plot size and shape using the yield data of 1200 basic units (each of 0.6 $m^2$). The data were subjected to two procedures of statistical analysis to estimate the optimum plot size, when the cost of conducting the experiment is not taken into consideration and to evaluate the effect of changing the plot shape on the variability. The first statistical method was that of maximum curvature which is based on the exponential relationship between plot size and the coefficient of variability. The second method was that developed by **smith̕s method (1938)**. Bartlett's test for homogeneity of variances, as outlined by **Steel and Torrie (1980)**, was used to study the effect of changing plot shape. The obtained results could be summarized as follows: Increasing the plot size decreased the variance per basic unit and the coefficient of variability. However, the reduction was not in proportion with the increase in plot size. The index of soil variability ranged from 0.6433 to 0.6018as an average for the 1st and the 2nd seasons, respectively. The relationship between the coefficient of variability (C.V.) and plot size (X) were mathematically expressed by the following equation C.V. = $19.21\ X^{-0.2595}$ for the 1st season and C.V. = $19.60\ X^{-0.2725}$ for the 2nd one. Accordingly, using the soil variability index, the optimum plot size was 2 basic units (1/3500 fed.) for the two seasons, while it was 4 basic units (1/1750 fed.) in both seasons when themaximum curvature method was applied. The required number of replications for the optimum plot size using Smith method detecting a 15% difference among treatment means varied 13 and 14 in the 1st and the 2nd seasons, respectively. But, for detecting a 20% difference among treatment means, 7 replications in the 1st season and 8 replications in the 2nd one were found necessary. Optimum plot size estimated using the maximum curvature method detecting a 15% difference among treatment means varied 7 and 8 in the 1st and the 2nd seasons, respectively. But, for detecting a 20% difference among treatment means, 4 replications in the 1st and 2nd season's one were found necessary. Generally, the plot shape did not affect on the precision of wheat yield trial in most cases in the two growing seasons.

**Key words**:*Wheat, number of replicates, plot size and shape, uniformity trials.*