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ESTIMATION OF THE OPTIMUM PLANT SAMPLE SIZE FOR YIELD AND ITS COMPONENTS IN LENTIL

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Abstract

Two experiments were conducted at Giza and Sids Research Stations in 1999/2000 season, to determine the optimum plant sample size for yield and its components and morphological characters in lentil. Five plant sample sizes (10, 20, 30, 40 and 50 plants/plot) with the whole plant-plot population were used with the new lentil varieties Giza 4 and Giza 51. Results indicated that the characters, which had high variation, needed large sample size. The optimum plant sample size was found to be 20-30 plants to estimate seed yield/plant, 30 plants for number of pods and seeds/plant, 10 plants for plant height and number of branches/plant. Biological and straw yield/plant were not accurately estimated from samples and they should be estimated from whole plots. Similar trend for sample size was obtained in both varieties in most studied characters, which exhibited signficant location x sample size interaction. Therefore, further studies should be carried out in various locations rather than in a single location to remove the location effect.

INTRODUCTION

The sampling in experimental plots is important since plot size for field experiments is usually selected to achieve a prescribed degree of precision for measurement of the character of primary interest, such as yield. Because yield character is difficult to measure, and the required plot size is often larger than that needed to measure other characters. Thus, if the measurements of additional characters are made by sampling a fraction of the whole plot, cost and time can be saved. An appropriate sample is that one which provides an estimate that is as close as possible to the value that would have been obtained if all plants in the plot have been measured.

Determination of optimum plant-sample size in lentil is important since the information from previous studies showed non-logical weak correlations between seed yield and yield components characters, which ranged from 0.02 to 0.56 (Muehlbour, 1974,

Kumar *et al.*, 1983; Esmail *et al.*, 1994; Selim, 2000). The low correlations between seed yield and its compoenent characters in lentil were mainly due to small sample sizes (ranging from 5-10 plants/sample) that were used to measure such characters. For example, correlation values between seed yield and number of pods/plant were reported as 0.25 (Muehlbauer, 1974), 0.15 (Kumar *et al.*, 1983) and 0.19 (Selim, 2000) when 5-10 individual plants have been used as sample size. But, the correlation value between number of pods and seed yield was high and recorded 0.71 (Hamdi *et al.*, 1991a) when number of pods/plant was estimated from the whole plot plants.

The optimum plant sample size in lentil has been determined by El-Attar (1991). He found that 20 plants is the optimum sample to represent seed yield and 40 plants is the optimum sample for number of seeds/plant and 100-seed weight. He noted that future studies should emphasize the effect of sample size on growth characters. Nasr and El-Hady (1998) mentioned that the characters with high variation between plants need relatively larger plant samples than those with low variation in faba bean. The present investigation aimed to determine the optimum plant sample for yield and its components and morphological characters in lentil.

MATERIALS AND METHODS

This study was conducted at Giza and Sids Research Stations, to compare between five plant sample sizes (10, 20, 30, 40 and 50 plants/plot) and the whole population of plant per plot to determine the optimum plant sample size for measuring different lentil characters. In these experiments the two new released lentil varieties Giza 4 and Giza 51 (Hamdi, 1998) were used with split-plot design, where the varieties were arranged in the main plots and the sample sizes in the sub-plots. Four replicates were used in each experiment with 5.4 m^2 plot area, at harvesting the borders were discarded and the central 1.2 m^2 was maintained, then the individual plants were randomly harvested according to the number of plants/sample allocated in each sub-plot, and all the remaining plants in each plot were harvested individualy by hand, air dried, weighed, treshed by hand and then the clean seeds weighed. The following chaeracters were estimated from individual plants collected as samples: seed yield/plant, biological yield/plant, straw yield/plant, number of pods/plant, number of seeds/plant, plant height and number of branches/plant. The same characters were estimated from all plants col-

lected in each plot to represent the whole plot population, which considered as a control. Other four characters were estimated on the whole plot basis: days to 50% flowering, days to 90% maturity, number of seeds/pod, and 100-seed weight (g).

Data were subjected to statistical analysis according to Gomez and Gomez (1984). The optimum plant-sample size is that insignificantly differed from the whole plot population.

RESULTS AND DISCUSSION

The combined analysis of variance over locations, varieties and plant sample sizes and their interactions for lentil characters estimated on the basis of individual plants (Table 1) and lentil characters estimated on the whole plant-plot population basis (Table 2) showed significant effect of location on all studied characters, except number of seeds/pod and days to maturity. The interaction effect of location x variety was significant only in seed yield/plant, number of pods/plant and plant height, while, the effect of sample size was significant in all studied characters, except number of branches/plant (Table 1). The first order interaction of location x sample size (LS) and variety x sample size (VS) and the second order interaction of location x variety x sample size (LVS) were significant in some studied characters as shown in Table (1).

Location and genotype effects:

The high magnitude of mean square of location effect for various characters indicating the predominant effects of locations on the performance of all lentil characters, except days to 90 % maturity. Performances at Giza was higher for all characters than Sids, except for 100-seed weight. For example, seed yield/plant at Giza was 0.930 g/plant while it was 0.564 g at Sids, giving an increase of 64.9 %. The superiority of lentil characters at Giza may be due to the differences in soil fertility and other environmental conditions between the two sites, suggesting the possibility of increasing yield levels through improved management practices such as soil fertility, fertilization,.. etc. Important location effects on performance of lentil characters were previously reported by many researchers (Pandey *et al.*, 1982; Ahmed and Pandey, 1983; Erskine, 1983; Mohamed *et al.*, 1989; Hamdi *et al.*, 1991a; Hamdi *et al.*, 1991b; Hamdi and Rabeia, 1991 and Hamdi *et al.*, 1992).

The significant variety effects indicate the presence of substantial differences between Giza 4 and Giza 51 for some studied characters. For example, the variety Giza 4 gave average seed yield of 0.660 g/plant, while Giza 51 exhibited seed yield/plant of 0.834 g with a yield increase of 26.4 %. The seed yield increase of Giza 51 was due to higher number of pods and seeds/plant. Giza 4 was taller than Giza 51, as the plant height estimates of both varieties were 52.47 and 48.59 cm, respectively. Giza 51 had slightly more branches than Giza 4. However, both varieties flowered and matured almost at same dates.

Optimum plant sample size for various lentil characters:

The significant values of variance for the interactions reflect the importance of location and variety for determining optimum plant-sample size. For comparison between characters, the estimates of phenotypic coefficient of variation of sample size for the characters measured on the basis of individual plants were calculated. In the following part, the differences between sample sizes and their interactions with locations and varieties will be discussed for each of the seven character estimated.

Seed yield per plant:

The data in Table (3) revealed that at Giza research station the average seed yield/plant of 10 plant-sample size was the only sample size which had significant difference from the whole plot mean. Other sample sizes of 20, 30, 40 and 50 plant showed no significant differences with the whole plot plants treatment, Thus, these sample sizes could be considered optimum. A similar trend was observed for the variety Giza 51 at Giza, where all plant-sample sizes had insignificant differences with the whole plot plants, except the sample size of 10 plants.

At Sids a varied trend was observed, where the plant-sample sizes of 10, 20 and 50 had insignificant differences from the whole plot estimates for both varieties. This varied trend between Giza and Sids is mainly due to the significant interaction between location x sample size.

The combined data, overall varieties, at Giza and Sids in Table (3) showed that at Giza the two samples of 10 and 50 plants differed significantly from the whole plot plants, while all other sample sizes showed insignificant differences with the whole plot

plants. In contrast, at Sids the 40 plant sample size was the only treatment that differed significantly with the whole plot plants, while other sample sizes had insignificant differences with the whole plot sample. Again this varied trend between Giza and Sids is due to significant interaction of location x sample size and variety x sample size. The overall combined data in Table (3) indicated that the sample sizes of 20 and 30 plants were insignificantly differ from the whole plot plants. These results suggest that 20 or 30 plants/sample are considered the optimum plant-sample sizes to measure seed yield/plant.

The accumulated data of seed yield/plant indicated that small sample size, with the exception of few cases, overestimated seed yield/plant. The over-estimation of seed yield/plant may be due to a greater opportunity for selectivity with small sample (10 plants) than with other larger sample sizes. A similar finding was reported in lentil by El-Attar (1991). In this regard, Aristarkhova and Voluzneva (1982) mentioned that since phenotypic plasticity of lentil is high, the use of 10 individual plants to represent the population leads to high experimental error. Therefore, Hamdi (1987) used the whole plot plants to measure yield and yield components in lentil.

Biological yield per plant:

The data in Table (4) indicated that comparison between the average biological yields of the various plant-sample sizes, on one side, and the average of biological yield/plant estimated on the whole plot, on the other side, shows that all sample sizes had significant differences from the whole plot estimates. That was true in most cases for Giza 4 and Giza 51 and at Giza and Sids as well as the overall data, except the average of sample sizes for Giza 4 at Giza. Interestingly, these data indicated that biological yield/plant in lentil is not accurately estimated by sampling individual plants, even with 50 plants/sample. Thus this character should be estimated on the whole plot.

Biological yield combines both seeds and the straw yields, and was more influenced by environmental conditions than seed yield/plant and hence had more variation than seed yield character. This was confirmed by high value of phenotypic coefficient of variation (PCV %) of biological yield/plant which was 76.86 % compared to 54.87 % for seed yield/plant.

Straw yield per plant:

The data in Table (4) show that there were signficant differences among sample sizes in all cases, as in Giza 4 and Giza 51 at each location, and in the overall averages of combined data. On the other hand, the data showed also that all plant-sample sizes at all cases have significant differences with the averages of whole plot plant. These results indicated that non of the plant-ample sizes valid to represent the whole plot. The data suggested again that straw yield/plant should be estimated on whole plot basis, like biological yield/plant.

The estimated value of phenotypic coefficient of variation (PCV) for straw yield/ plant was the highest values among all studied characters and recorded 97.36 %. Worthwhile, both biological yield/plant and straw yield/plant have the highest values of (PCV) and at the same time both characters should be estimated by the whole plot plants. It seems that the characters, which have large variations, need large plant samples to represent the whole population perfectly.

Number of pods per plant:

The combined results in Table (5) revealed that all plant-sample sizes at Giza were significantly differed from the whole plot plants, while at Sids the samples of 10, 30 and 50 plant showed no significant differences from the whole plot estimates. These differences between Giza and Sids reflected the presence of significant interaction of location x sample size. Concerning the overall data, the sample size of 30 plants had no significant difference with the whole plot- plant, and hence it considered the optimum sample size.

The estimated value of phenotypic coefficient of variation (PCV) of pods/plant (45.70 %) was close to the corresponding value of seed yield/plant, which was 54.87 %. In this regard, El-Attar (1991) reported that the optimum plant sample size for number of pods/plant in lentil was ranged from 20 to 40 plants, which agreed with our results.

Number of seeds per plant:

The sample sizes of 10, 20, 30 and 40 plants at Giza were insignificantly differ from the whole plot plants (Table 5), while at Sids the sample sizes that did not differ significantly from the whole plot plants were 30 and 50 plants. These differences between both locations reflected the significant interaction effect of location x sample size. The average performance of plant sample sizes overall varieties and locations revealed that the sample size of 30 plants was the only one which did not vary significantly from the whole plot plants, and hence it could be considered the optimum sample size. El-Attar (1991) found that 10 or 40 plants were the optimum sample size for seeds per plant in narrow rows, which agree with our results. The phenotypic coefficient of variation of sample size of this character was 36.45 %, which was close to the corresponding value of number of pods/plant. Worthwhile, both number of seeds and pods/plant showed the same optimum plant sample size of 30 plants.

Plant height:

At Giza the plant-sample sizes showed no significant differences between them and with the whole plot plants for both varieties (Table 6). Similar trends were observed at Sids for both varieties. These results reflected the absence of significant interaction of variety x sample size, location x sample size and location x variety x sample size as shown before. The combined data showed similar results, where no significant difference among plant-sample sizes and between them and the whole plot plants were observed at both locations, except the 10 plants sample at Sids. The overall data for various sample sizes indicated also that no significant differences between sample sizes and the whole plot plants. The accumulated data of plant height suggested that all plant-sample sizes are valid to measure plant height, but from the economic point of view, small sample size of 10 plants/sample considers the optimum size to represent the whole plot plants for plant height in lentil. Worthwhile, the phenotypic coefficient of variation of plant height was the lowest value among all characters and reached 10.94 %.

Number of branches per plant:

No significant differences occurred between sample sizes and the whole plot plants in all cases, except 40 plants/sample of Giza 4 at Giza (Table 6). These data suggest that small sample size of 10 plants is considered the optimum to measure number of branches/plant in the present study. This finding was similar to those obtained for plant height. Also, number of branches/plant showed low (PCV) value of 25.44.

It could be concluded that the optimum plant sizes were 20-30 plants for seed yield/plant, 30 plants for both number of seeds and pods/plant and 10 plants for both plant height and number of branches/plant. While, biological and straw yield/plant characters should be estimated from the whole plot plants. These results agree with those previously reported in lentil by El-Attar (1991) who found that the optimum sample size for lentil characters were 20 plants for seed yield/plant, 20 plants for pods/plant and 40 plants for number of seeds/plant.

It seems that the characters, which had high variation, needed large sample size. As indicated above, the studied characters could be classified into three groups. The first group consisted biological and straw yield/plant, which had the highest variation values (PCV %) of 76.86 % and 97.36 %, respectively. These characters should be estimated from the whole plot plants. The second group characters are seed yield/plant, number of pods/plant and number of seeds/plant. They showed moderate estimates of (PCV %) as 54.87 %, 45.70 % and 36.45 %, respectively, and they may be estimated from a sample size ranged from 20-30 plants. While the third group of characters was plant height and number of branches/plant, which exhibited the smallest values of (PCV %) of 10.94 % and 25.44 % and needed 10 plants/sample to be measured. These results agree with the finding of Nasr and El-Hady (1998) in faba bean who found that characters with high variation needed larger sample size to be measured and characters with low variation needed smaller sample size.

The obtained results also indicated that most studied characters, exhibited significant location x sample size interaction. Therefore, such studies should be carried out in various locations rather than in a single location to remove the location effect. Since the present investigation involves two locations, the above recommendations for plant

sample size were based on the combined analysis over locations and therefore assume greater validity over those from single locations.

Table 1. Mean squares for combined analysis of variance of seed yield (g)/plant (SY), biological yield (g)/plant (BY), straw yield (g)/plant (STY), number of pods/plant (pods), number of seeds/plant (Seeds), plant height (PLHT) and number of branches/plant (BRPL) estimated on the individual plant sample-plot basis.

Source of variance	d.f.	Mean Square						
		SY	BY	STY	Pods	Seeds	PLHT (cm)	BRPL
Replication	3	0.004^{NS}	1.331^{NS}	0.845^{NS}	34.968^{NS}	58.540^{NS}	18.773^{NS}	5.819^{NS}
Location (L)	1	3.212**	146.397**	148.927**	8156.750**	7722.094**	596.505*	158.775**
Error (a)	3	0.016	0.162	0.328	45.971	40.606	46.237	5.956
Variety (V)	1	0.721**	1.438^{NS}	1.231^{NS}	2047.030**	1576.261**	359.988*	54.391**
LV	1	0.109*	3.394^{NS}	0.000^{NS}	144.305*	405.082^{NS}	234.063*	0.592^{NS}
Error (b)	6	0.018	2.156	0.759	13.726	84.838	33.048	4.767
Sample size (S)	5	0.168**	10.253**	11.100**	142.040**	191.981**	30.530*	1.688^{NS}
LS	5	0.219**	1.024^{NS}	0.576*	82.763**	140.468*	13.364^{NS}	1.501^{NS}
VS	5	0.065**	1.575*	0.412^{NS}	7.084^{NS}	90.513^{NS}	16.716^{NS}	2.593^{NS}
LVS	5	0.020^{NS}	1.240^{NS}	0.745*	42.978*	136.227*	6.051^{NS}	2.114^{NS}
Error (c)	60	0.017	0.598	0.243	14.063	58.937	11.417	1.624

*, ** Significant at 0.05 and 0.01 levels of probability, respectively.

NS: Not Significant.

Table 2. Mean squares for combined analysis of variance of number of seeds/pod (SP), 100-seed weight (100 SW), days to 50 % flowering (DFL), and days to 90 % maturity (DMAT) estimated on the whole plant-plot population basis.

Source of variance	d.f.	SP	100 SW (g)	DFL (days)	DMAT (days)
Replication	3	0.005^{NS}	0.019^{NS}	3.486^{NS}	3.292^{NS}
Location (L)	1	0.091^{NS}	3.413**	1520.042**	13.500^{NS}
Error (a)	3	0.026	0.001	11.597	2.528
Variety (v)	1	0.024^{NS}	0.038^{NS}	0.167^{NS}	40.042*
LV	1	0.012	0.018^{NS}	8.167^{NS}	0.167^{NS}
Error (b)	6	0.028	0.022	11.444	4.299

*, ** Significant at 0.05 and 0.01 levels of probability, respectively.

NS: Not Significant.

Table 3. Average of seed yield (g)/plant for five sample sizes comparing with the whole plot plants of Giza 4 and Giza 51 grown at Giza and Sids Research Stations and their combined data in 1999/2000 season.

Variety / Location	Sample size for seed yield/plant					Whole plot basiss
	10	20	30	40	50	
Giza						
Giza 4	1.190^{A}	0.938^{B}	0.752^{BC}	0.723^{C}	0.888^{BC}	0.772^{BC}
Giza 51	1.430^{A}	0.942^{BC}	0.745^{C}	0.863^{BC}	1.070^{B}	0.847^{BC}
Sids						
Giza 4	0.383^{BC}	0.415^{ABC}	0.633^{A}	0.542^{AB}	0.410^{ABC}	0.280^{C}
Giza 51	0.730^{B}	0.627^{BC}	0.527^{C}	0.863^{A}	0.680^{B}	0.680^{B}
Combined						
Giza station	1.310^{A}	0.940^{BC}	0.749^{D}	0.793^{CD}	0.979^{B}	0.810^{CD}
Sids station	0.556^{B}	0.521^{B}	0.580^{B}	0.703^{A}	0.545^{B}	0.480^{B}
Overall	0.933^{A}	0.731^{BCD}	0.664^{CD}	0.748^{BC}	0.762^{B}	0.645^{D}

Means not followed by the same letter are significantly different at 0.05 level.

Table 4. Average of biological yield (g)/plant and straw yield/plant for five sample sizes comparing with the whole plot plants of Giza 4 and Giza 51 grown at Giza and Sids Research Stations and their combined data in 1999/2000 season.

Variety	Sample size for biological yield/plant					Whole plot
Location	10	20	30	40	50	plants
Giza						
Giza 4	5.878^{AB}	5.410^{B}	4.943^{BC}	4.050^{C}	5.688^{AB}	6.832^{A}
Giza 51	4.577^{CD}	4.630^{CD}	4.205^{D}	5.842^{B}	5.620^{BC}	7.138^{A}
Sids						
Giza 4	2.310^{B}	2.260^{B}	2.260^{B}	2.550^{B}	2.020^{B}	4.325^{A}
Giza 51	3.215^{BC}	3.315^{BC}	2.217^{C}	3.572^{AB}	2.490^{BC}	4.640^{A}
Combined						
Giza station	5.228^{BC}	5.020^{BC}	4.574^{C}	4.946^{BC}	5.654^{B}	6.985^{A}
Sids station	2.762^{BC}	2.787^{BC}	2.239^{C}	3.061^{B}	2.255^{C}	4.483^{A}
Overall	3.995^{B}	3.904^{BC}	3.406^{C}	4.004^{B}	3.954^{B}	5.734^{A}

Variety	Sample size for straw yield/plant					Whole plot
Location	10	20	30	40	50	plants
Giza						
Giza 4	4.688^{B}	4.472^{BCD}	3.850^{CD}	3.670^{D}	4.620^{BC}	6.028^{A}
Giza 51	4.267^{BC}	5.067^{B}	3.460^{C}	4.980^{B}	4.622^{B}	6.285^{A}
Sids						
Giza 4	1.237^{C}	1.802^{BC}	1.622^{BC}	1.947^{B}	1.870^{B}	3.897^{A}
Giza 51	2.225^{B}	1.860^{B}	1.682^{B}	2.150^{B}	1.807^{B}	4.015^{A}
Combined						
Giza station	4.477^{B}	4.770^{B}	3.655^{C}	4.325^{B}	4.621^{B}	6.156^{A}
Sids station	1.731^{BC}	1.831^{BC}	1.652^{C}	2.049^{B}	1.839^{BC}	3.956^{A}
Overall	3.104^{B}	3.301^{B}	2.654^{C}	3.187^{B}	3.230^{B}	5.056^{A}

Means not followed by the same letter are significantly different at 0.05 level.

Table 5. Average of number of of pods/plant and seeds/plant for five sample sizes comparing with the whole plot plants of Giza 4 and Giza 51 grown at Giza and Sids Research Stations and their combined data in 1999/2000 season.

Variety / Location	Sample size for (number of plants) 10	20	30	40	50	Whole plot plants
Giza						
Giza 4	35.200^{AB}	36.675^{A}	28.300^{C}	29.075^{BC}	38.300^{A}	23.900^{C}
Giza 51	39.757^{A}	40.700^{A}	38.200^{A}	38.925^{A}	42.800^{A}	31.950^{B}
Sids						
Giza 4	8.175^{C}	9.675^{BC}	11.625^{B}	15.757^{A}	11.500^{B}	9.575^{BC}
Giza 51	21.675^{ABC}	27.375^{A}	16.575^{C}	26.825^{AB}	23.400^{ABC}	20.400^{BC}
Combined						
Giza station	37.388^{AB}	38.688^{A}	33.250^{B}	34.000^{B}	40.550^{A}	27.925^{C}
Sids station	14.925^{C}	18.525^{AB}	14.100^{C}	21.200^{A}	17.450^{BC}	14.988^{C}
Overall	26.156^{BC}	28.606^{AB}	23.675^{CD}	27.600^{AB}	29.000^{A}	21.456^{D}

Variety / Location	Sample size for no. of seeds/plant 10	20	30	40	50	Whole plot plants
Giza						
Giza 4	51.325^{AB}	48.300^{AB}	38.375^{B}	40.675^{AB}	53.475^{A}	37.775^{B}
Giza 51	47.275^{AB}	47.300^{AB}	43.600^{B}	51.350^{AB}	56.175^{A}	48.200^{AB}
Sids						
Giza 4	20.775^{AB}	28.400^{A}	29.075^{A}	23.925^{AB}	19.575^{BC}	15.900^{C}
Giza 51	43.225^{A}	40.025^{A}	25.100^{B}	39.475^{A}	31.875^{AB}	31.225^{AB}
Combined						
Giza station	49.300^{AB}	47.800^{AB}	40.987^{B}	46.013^{AB}	54.825^{A}	42.987^{B}
Sids station	32.000^{AB}	34.213^{A}	27.088^{BC}	31.700^{AB}	25.725^{BC}	23.563^{C}
Overall	40.650^{A}	41.006^{A}	34.038^{BC}	38.856^{AB}	40.275^{A}	33.275^{C}

Means not followed by the same letter are significantly different at 0.05 level.

Table 6. Average of plant height (cm) and no. of branches/plant for five sample sizes comparing with the whole plot plants of Giza 4 and Giza 51 grown at Giza and Sids Research Stations and their combined data in 1999/200 season.

Variety / Location	Sample size for plant height					Whole plot plants
	10	20	30	40	50	
Giza						
Giza 4	55.300^{A}	56.125^{A}	56.950^{A}	58.450^{A}	55.725^{A}	56.550^{A}
Giza 51	51.350^{A}	50.475^{A}	50.275^{A}	48.200^{A}	47.300^{A}	49.525^{A}
Sids						
Giza 4	50.925^{A}	46.625^{A}	48.025^{A}	48.500^{A}	47.975^{A}	48.400^{A}
Giza 51	52.600^{A}	46.775^{BC}	48.125^{AB}	48.575^{AB}	42.225^{C}	47.650^{AB}
Combined						
Giza station	53.325^{A}	53.300^{A}	53.613^{A}	53.325^{A}	51.513^{A}	53.038^{A}
Sids station	51.763^{A}	46.700^{B}	48.075^{B}	48.538^{AB}	45.100^{B}	48.025^{B}
Overall	52.544^{A}	50.000^{BC}	50.844^{AB}	50.931^{AB}	48.306^{C}	50.531^{ABC}

Variety / Location	Sample size for branches/plant					Whole plot plants
	10	20	30	40	50	
Giza						
Giza 4	5.650^{A}	6.550^{A}	5.525^{A}	4.000^{B}	6.100^{A}	5.550^{A}
Giza 51	7.800^{A}	7.350^{A}	5.575^{A}	8.350^{A}	7.025^{A}	7.250^{A}
Sids						
Giza 4	2.905^{A}	3.300^{A}	2.780^{A}	3.600^{A}	3.150^{A}	3.150^{A}
Giza 51	3.750^{B}	4.600^{AB}	4.200^{AB}	5.325^{A}	4.625^{AB}	4.475^{AB}
Combined						
Giza station	6.725^{A}	6.950^{A}	5.550^{A}	6.175^{A}	6.562^{A}	6.400^{A}
Sids station	3.327^{B}	3.950^{AB}	3.490^{AB}	4.462^{A}	3.888^{AB}	3.812^{AB}
Overall	5.026^{AB}	5.450^{A}	4.520^{B}	5.319^{AB}	5.225^{AB}	5.106^{AB}

Means not followed by the same letter are significantly different at 0.05 level.

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تقدير أنسب حجم للعينة النباتية لتقدير كمية المحصول ومكوناته فى العدس

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اقيمت تجربتان بمحطتى البحوث الزراعية بكل من الجيزه وسدس فى موسم ١٩٩٩/٢٠٠٠ لدراسة أنسب حجم للعينة النباتية لصفات محصول البذور للنبات الفردى، المحصول البيولوجي، محصول التبن/ نبات، عدد القرون/ نبات، عدد البذور/ نبات، طول النبات وعدد الفروع للنبات ، وقد تم دراسة خمسة أحجام للعينة وهي ١٠، ٢٠، ٣٠، ٤٠، ٥٠ نبات مقارنة مع كل نباتات القطعة التجريبية وذلك على الصنفين الجديدين للعدس جيزة٤، جيزة ٥١ . وقد أشارت النتائج إلى أن الصفات ذات التباين العالى تحتاج إلى حجم عينة أكبر لتقديرها من ذات التباين المنخفض.

أظهرت النتائج أن انسب عدد لنباتات العينة هو ٢٠-٣٠ نبات لصفة محصول البذور للنبات، ٣٠ نبات لصفة عدد القرون وعدد البذور للنبات، و١٠ نباتات لصفة طول النبات وعدد الفروع ، بينما يصعب قياس صفة المحصول البيولوجى ومحصول التبن للنبات بواسطة النباتات الفردية وإنما يجب قياسهما من كل نباتات القطعة التجريبية، وقد اظهر الصنفان سلوكاً متشابها في اغلب الصفات المدروسة، كما أظهرت النتائج وجود تأثيرا معنويا للتفاعل بين الجهة وحجم العينة ولذلك فان أى دراسة لحجم العينة فى العدس يجب أن تقام فى اكثر من جهة وذلك لاستبعاد تأثير الجهات.