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EFFECT OF BORDER AND END ROW PLANTS IN THE EFFICIENCY AND THE ACCURACY OF FODDER BEET EXPERIMENTS

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ABSTRACT

Fodder beet is an ideal fodder crop for dairy cattle. As border and end-border effect (alley width and end plants of the rows) is one of component of the experimental error of fodder beet trials. Removing the rows, which are adjacent to the alley and end plants of the rows, can eliminate this effect. The purpose of this study was to develop accurate factors to adjust rows yields to decrease sampling errors of fodder beet trials to control border and end-border effects in test plots. Two field experiments were conducted at Sids Agricultural Research Station Beni Suef Governorate, during the two growing seasons of 1999/2000 and 2000/2001 seasons. Four alley width were 0.7, 1.40, 2.10 and 2.80 m used as a treatments to clear the border effect and it arranged randomly in the middle of each plots in randomized complete block design with four replications. To study the border effect (alley width) on the yield of six rows from each side of each alley was calculated separately. The statistical analysis included all 12, 10, 8, 6, 4 and 2 rows after discarding 2, 4, 6, 8 and 10 rows adjacent the each side of the alleys, respectively. For study the end-border effect (end plants in rows) the root weight of each single plant in each row (12 plant/row) was calculated for all experimental plots. The statistical analysis included all 12, 10, 8, 6, 4 and 2 plants in each row after discarding 2, 4, 6, 8 and 10 plant from each end of the all rows in the plot, respectively.

The results for this study could be summarized as follows:

I-Effect of border distances (alley width) in fodder beet experiments:

The effect of removing the first and the second row from each side of each border distances in average of fresh fodder beet yield/plant, sampling error, experimental error and coefficient of variability for the efficient of the experiment and the accuracy of the analysis could be summarized as follows:

1- The average of fresh fodder beet yield/plant was reduced from 2.705, 3.337, 3.651 and 3.841 to 2.171, 2.268, 2.278 and 2.313 in the first season and it reduced from 2.649, 3.087, 3.433 and 3.768 to 2.209, 2.296, 2.278 and 2.250 in the second season.

2-The sampling error was reduced from 5.641 to 0.227 in the first season and from 6.178 to 0.278 in the second season.

3-The experimental error was reduced from 5.884 to 0.235 in the first season and it reduced from 4.709 to 0.169 in the second season.

4-The coefficient of variability was reduced from 20.31 to 7.46% in the first season and it reduced from 22.18 to 8.26% in the second season.

This result indicated that border effects extended to the first and the second row for all plots. Results also indicated that the efficient of the experiment and the accuracy of the analysis was increased and removing the first and the second row adjacent to the alleys would be sufficient to eliminate the most border effect in fodder beet trials.

II- Effect of end-border (end plants of rows) in fodder beet experiments:

The effect of removing the first and the second plant from each end of each row in average of fresh fodder beet yield kg/plant, sampling error, experimental error and coefficient of variability for the efficient of the experiment and the accuracy of the analysis could be summarized as follows:

1-The average of fresh fodder beet yield/plant was reduced from 3.816, 3.530, 3.537 and 3.745 to 2.843, 2.837, 2.885 and 3.086 in the first season and it reduced from 4.231, 4.242, 4.364 and 4.300 to 2.902, 3.145, 2.930 and 3.100 in the second season.

2-The sampling error was reduced from 0.290 to 0.125 in the first season and from 0.632 to 0.114 in the second season.

3-The experimental error was reduced from 0.805 to 0.582 in the first season and it reduced from 0.742 to 0.267 in the second season.

4-The coefficient of variability was reduced from 15.18 to 12.75% in the first season and it reduced from 18.55 to 11.02% in the second season.

This result clear that the end-border effects extended to the first and the second plant for all rows and the removal of these plants increase the efficient of the experiment and accuracy of the analysis and would be sufficient to eliminate the most end-border effect in fodder beet trials.

INTRODUCTION

Fodder beet is an ideal fodder crop for dairy cattle. The high yield and easy mechanization of operation from cultivation for this crop permit that to compete other fodder crops. Plants that grow along the ends of plots often are nor vigorous than those in the interior of plots. In most field trials it is necessary to restrict the spread of the treatment effect as much as possible to the next plot. As border effect is one of component of the experimental error. It is important to evaluate the extension of alley width effect on the adjoining rows. This source of variability in yield may be controlled by the use of adequate guard areas at the ends of the plot insure that the harvested area represents the treatment. Both border and end-border effects have been studies in a number of different crops. Arny and Hays (1918) reported that all small grain varieties did not responder that same to the bordering alley. Also Arny (1922), Huibert *et al.* (1931) and McCelland (1931) obtained significant border effects that attended to at least 12 inches within small grain plots. Hartwig *et al.* (1951) and Green (1956), found significant border effects in soybeans and cotton. Brown and Weibel (1957) reported that the increased yield in the border rows of wheat and oats was due to excessive tillering. Draper (1959)concluded that 12 inches should be removed from each end test plots in safflower. Drapala and Johnson(1961) found significant border effects in millet and sudangrass. Klages (1993) presented that border effects in small grains were intensified under drought conditions. Bhalli *et al.*(1964) believed that the removal one foot from each plot end would be sufficient to eliminate most end-border effects in barley yield trials. Wilcox (1970) reported that border effect could be adequately controlled by trimming 0.6 m from each end of plots in soybeans yield trials. Gomez and DeDatta(1971) mentioned that excluding two rows on each side of the plot was sufficient to eliminate the effect of border in rice varieties tests. EL-Rayes (1984) found that the coefficient of variation reduced from 22 to 14% for main plots and from 11 to 7% for sub plots when the first row adjacent to the alley was discarding from the analysis. Todd (1988) showed that yield in unordered plots was inflated 5 to 21% over bordered plots in cucumber yield trials. Romani et al (1993) suggested that in wheat and barley variety trials the 30-40 cm at both ends of each plot should be removed mechanically to control the effect of border. El-Taweel (1994) concluded that in maize trials the first or the first and second plants in each end of rows should be effects guarded plants. Results also showed that including the yield of the first and second row adjacent to the alley increased the variation among the data and consequently decreased the accuracy of the experiment. Removing the two rows that are adjacent to the alley can eliminate this effect. Binder-DL and Sander-DH (1998) found that the ammonium nitrate was broadcast to the center two rows of a four-row plot, all four rows of a four-row plot, and all six rows of a six-row plot. It is concluded that there is little reason for plots larger than four rows.

The purpose of this study was to develop accurate factors to adjust rows yields to decrease sampling errors of fodder beet trials to control border and end-border effects in test plots.

MATERIALS AND METHODS

Two field experiments were conducted at Sids Agricultural Research Station Beni Suef Governorate, during the two growing seasons of 1999/2000 and 2000/2001. This study was aimed to detect 1) effects of border (alley width) and end-border (end plants of row) in fodder beat yield trails to adjust the row yields. 2) Decrease the sampling errors by controlling on border and end-border effect in test plots. Four alley width were 0.7, 1.40, 2.10 and 2.80to clear the border effect and it arranged randomly in the middle of each plots in randomized complete block design with four replications. The experimental plot was 24.8 m^2 and consisted of 12 rows with 3 m length and 0.7 m width per row. The plants were sown, in hills with 25 cm apart. The hills were thinned to a single plant 30 days after planting with 12 plant/row and variety Brigadier was used. Cultural practices for growing fodder beet were carried out as recommended.

Statistical analysis:

To study the border effect (alley width) the yield of fresh fodder beet yield of six rows from each side of each alley was calculated separately. The statistical analysis included all 12, 10, 8, 6, 4 and 2 rows after discarding 2, 4, 6, 8 and 10 rows adjacent the each side of the alleys respectively.

For study the end-border effect (end plants in rows) the root weight of fresh fodder beet for each single plant in each row (12 plant per row) was calculated. The statistical analysis included all 12, 10, 8, 6, 4 and 2 plants in each row after discarding 2, 4, 6, 8 and 10 plant from each end of the all rows in the plot, respectively.

The analysis of variance was carried out with sub sampling method as shown in Table 1. The mean square error, sampling error, coefficient of variation were used to estimate the effect of border and end-border.

Table 1: Sub sample analysis for randomized complete block design.

Source of variation	Degree of freedom
Replication	3
Treatments	3
Experimental error	9
Sampling error	176

The data obtained in each season were statistically analyzed followed the produced outlined by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The results and discussion for the effect of border distances (alley width) and end-border plants (end row plants) in fodder beat yield trials were carried out under two main parts as follows:

I- Effect of border distances (alley width) in fodder beet yield trials:

The effect of border distances (alley width) in fodder beat yield trials could be discussed as follows:

a- The average of fresh fodder beet yield kg/plant as affected by border distances.

Table 2 present the average of fresh fodder beet yield kg/plant from 12, 10, 8, 6, 4 and 2 rows which were analyzed as affected by 0.6, 1.2, 1.8 and 2.4-m of border distances. These averages were 3.842, 2.939, 2.313, 2.443, 2.352 and 2.240 Kg in the first season and it were 3.768, 2.983, 2.250, 1.998, 1.865 and 1.835 kg in the second season from 12, 10, 8, 6, 4 and 2 row in each plot, respectively. Results in the first season revealed that this average was reduced from 2.705, 3.337, 3.651 and 3.841 to 2.171, 2.268, 2.278 and 2.313 by removing the first and the second row from each side of each border distance for the cases of 12 and 8 row/plot, respectively. In the second season this average was reduced from 2.649, 3.087, 3.433 and 3.768 to 2.209, 2.296, 2.278 and 2.250 by removing the first and the second row from each side of each border distance for the cases of 12 and 8 row/plot, respectively. This result indicated that border effects extended to the first and the second row for all plots and the removal of these rows reduced the average of fresh fodder beet yield kg/plant an appreciable extent and it adjusted the average yield for all cases that were analyzed.

b- The sampling error as affected by border distances.

The estimates of sampling error for 12, 10, 8, 6, 4 and 2 row/plot clears in Table 3 and Fig 1. These estimates were 6.641, 2.428, 0.227, 0.105, 0.56 and 0.028 in the first season and it were 6.178, 1.522, 0.278, 0.077,0.027 and 0.019 in the second season for 12, 10, 8, 6, 4 and 2 row/plot, respectively. These values were reduced from 5.641 to 0.227 in the first season and from 6.178 to 0.278 in the second season with removing the first and the second row from each side of each alley for the cases of 12 and 8 row/plot, respectively. This result indicated that the border effects reached to the first and the second row for all plots and the removal of these rows decreasing the sampling error and increasing the accuracy of the analysis.

Table 2: The average of fresh yield/plant kg for 12, 10, 8, 6, 4 and 2 row/plot that were analyzed as affected by different border distances in 1999/2000 and 2000/2001 seasons.

Border Distances	1999/2000					
	12 rows	10 rows	8 rows	6 rows	4 rows	2 rows
0.60 meter	2.705	2.499	2.172	2.389	2.385	2.21
1.20 meter	3.337	2.712	2.268	2.379	2.370	2.186
1.80 meter	3.651	2.861	2.278	2.380	2.342	2.144
2.40 meter	3.842	2.939	2.313	2.443	2.352	2.220
L.S.D	0.323	0.085	NS	NS	NS	NS
Border Distances	2000/2001					
	12 rows	10 rows	8 rows	6 rows	4 rows	2 rows
0.60 meter	2.649	2.539	2.209	1.951	1.943	1.81
1.20 meter	3.087	2.714	2.296	1.953	1.941	1.88
1.80 meter	3.433	2.813	2.278	1.940	1.925	1.849
2.40 meter	3.768	2.983	2.250	1.998	1.865	1.835
L.S.D	0.295	0.935	NS	NS	NS	NS

c- The experimental error as affected by border distances.

Table 3 and Fig 1 also show that the experimental error values were 5.884, 0.284, 235, 0.124, 0.075 and 0.048 in the first season and it were 4.907, 0.342, 0.169, 0.085, 0.047 and 0.034 in the second season for 12, 10, 8, 6, 4 and 2 row/plot respectively. In the first season these values were reduced from 5.884 to 0.235 and in the second season it reduced from 4.709 to 0.169 with removing the first and the second row from each side of each alley for the cases of 12 and 8 row/plot, respectively. This result indicated that the border effects extended to the first and the second row for all plots and the removal of these rows reducing the experimental error and extended to increase the efficient of the analysis and the accuracy of the trials.

Table 3: Experimental error, sampling error and coefficient of variation for 12, 10, 8, 6, 4 and 2 rows/plot that were analyzed as affected by different border distances in 1999/2000 and 2000/2001 seasons.

Source of Variation	1999/2000					
	Number of rows (basic unit) per plot					
	12 rows	10 rows	8 rows	6 rows	4 rows	2 rows
Experimental error	5.884	0.284	0.235	0.124	0.075	0.048
Sampling error	6.641	2.428	0.227	0.105	0.056	0.028
Coefficient of variation	20.31 %	17.91 %	7.46 %	5.51 %	4.95 %	4.18 %
Source of Variation	2000/2001					
	Number of rows (basic unit) per plot					
	12 rows	10 rows	8 rows	6 rows	4 rows	2 rows
Experimental error	4.907	0.342	0.169	0.085	0.047	0.034
Sampling error	6.178	1.522	0.278	0.077	0.027	0.019
Coefficient of variation	22.18 %	14.13 %	8.26 %	5.76 %	4.06 %	3.72 %

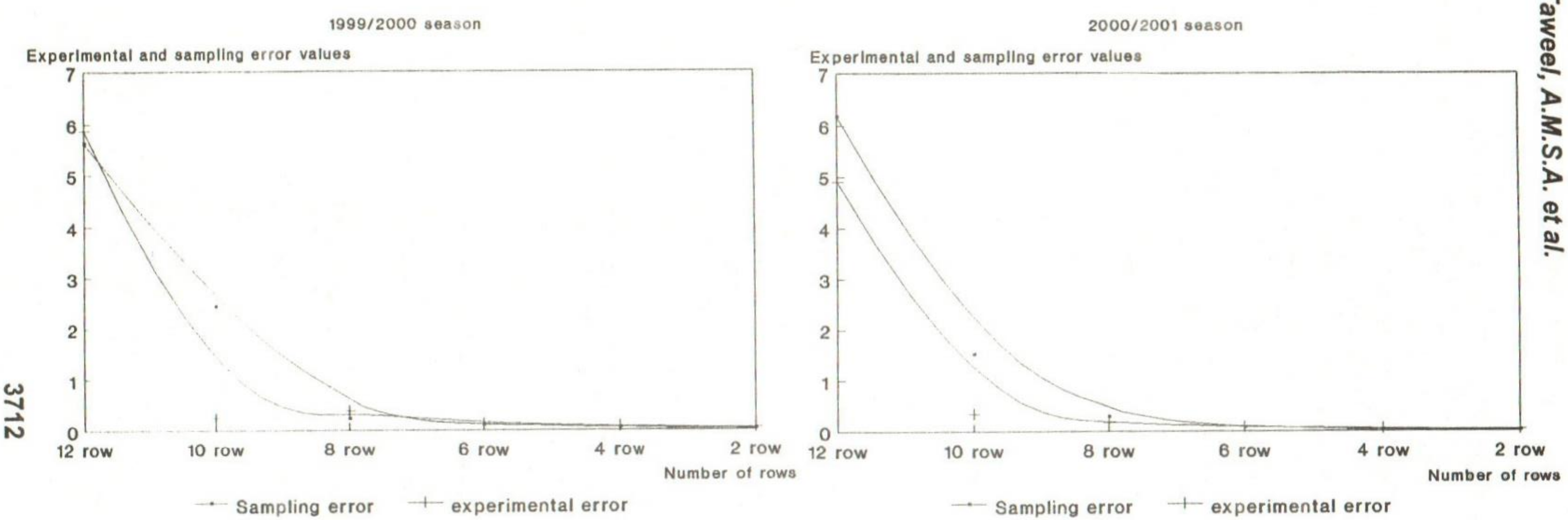

Fig.1: Sampling and experimental errors as affected by eliminating the adjacent rows of all border distances over all cases that were analyzed in the two seasons.

The comparison between sampling and experimental errors clears that the values of experimental error for 12 and 10 row/plot were less than the values of sampling error which indicated that the experimental error is not valid error for estimating the significant of treatments. On the other hand, the cases of 8, 6, 4 and 2 row/plot clear that the sampling error values were less than the experiential error, which indicated that the experimental error is the valid error. By this meaning we could be concluded that excluding first and second row adjacent to the alleys extended to exclude the effect of the border.

d- The coefficient of variation as affected by border distances.

The estimates of coefficient of variability were provided in Table 3 and fig 2. These values were 20.31, 17.91, 7.46, 5.51, 4.95 and 4.18% in the first season and it were 22.18, 14.13, 8.26, 5.76, 4.06 and 3.73% in the second season for 12, 10, 8, 6, 4 and 2 row/plot, respectively. These values were reduced from 20.31 to 7.46% in the first season and it reduced from 22.18 to 8.26% in the second season with removing the first and the second row from each side of each plot for the cases of 12 and 8 row/plot, respectively. This result clear that the border effects extended to the first and the second row for all plots and the removal of these plants increase the efficient of the experiment and the accuracy of the analysis and would be sufficient to eliminate the most border effect in fodder beet trials.

These results confirmed previous findings reported by Arny (1922), McCelland (1931), Huibert *et al.* (1931), Wilcox (1970), El-Rayes (1984), Todd (1988) and El-Taweel().

II-Effect bo(end plants of rows) in fodder beet trials:

The effect of end-border plants (end row plants) in fodder beet yield trials could be discussed as follows:

a- The average yield kg/plant as affected by end-border plants.

Table 4 revealed the average of fresh fodder beet yield kg/plant for 12, 10, 8, 6, 4 and 2 plant/row as affected by end-border plants. These results were obtained after discarding the effect of border by removing the adjacent rows for 0.6, 1.2, 1.8 and 2.4m border distance in 1999/2000 and 2000/2001 seasons. In the first season these averages were reduced from 3.816, 3.530, 3.537 and 3.745 to 2.843, 2.837, 2.885 and 3.086 by removing the first and the second plant from each end of each row for the cases of 12 and 8 plant/row, respectively. In the second season the average was reduced from 4.231, 4.242, 4.364 and 4.300 to 2.902, 3.145, 2.93 and 3.100 by removing the first and the second plant from each end of each row for the cases of 12 and 8 plant/row, respectively. This result indicated that end-border effects extended to the first and the second plant for all rows and the removal of these plants reduced the average of fresh fodder beet yield kg/plant an appreciable extent and it adjusted the average yield for all cases that were analyzed.

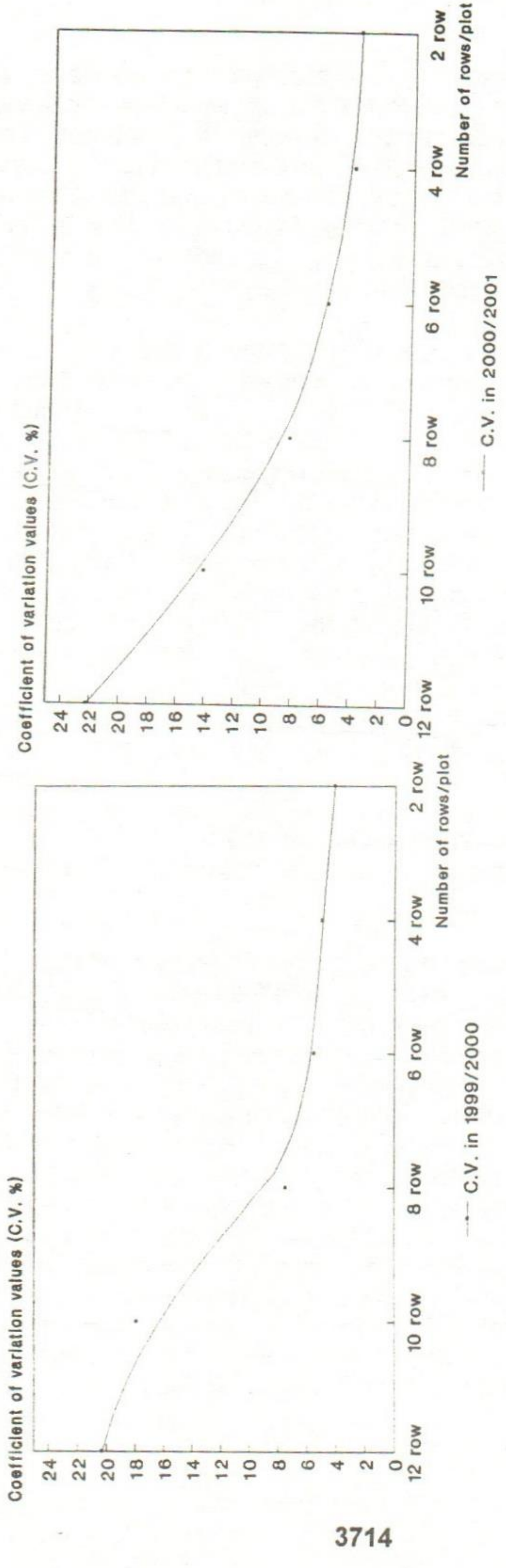

Fig.2: Coeficient of variation as affected by eliminating the adjacent rows of all border distances over all cases that were analyzed in the two seasons.

b- The sampling error as affected by end-border plants.

Table 5 and Fig 3 clear the values of sampling and experimental errors for 12, 10, 8, 6, 4 and 2 plant/row. The values of sampling error were 0.290, 0.191, 0.125, 0.123, 0.080 and 0.077 in the first season and it were 0.632, 0.220, 0.114, 0.065, 0.039 and 0.038 in the second season for 12, 10, 8, 6, 4 and 2 plant/row, respectively. These values were reduced from 0.290 to 0.125 in the first season and from 0.632 to 0.114 in the second season with removing the first and the second plant from each end of each row for the cases of 12 and 8 plant/row, respectively. This result indicated that the end-border effects extended to the first and the second plant for all rows and the removal of these plants decreasing the sampling error and increasing the efficient of the analysis.

Table 5: Experimental errors, sampling error and coefficient of variation for 12, 10, 8, 6, 4 and 2 plant/row as affected by different end-border plants after discarding the effect of border by removing the adjacent rows for 0.6, 1.2, 1.8 and 2.4m border distances in 1999/2000 and 2000/2001 seasons.

Source of Variation	1999/2000					
	12 plant/row	10 plant/row	8 plant/row	6 plant/row	4 plant/row	2 plant/row
Experimental error	0.805	0.785	0.582	0.461	0.106	0.079
Sampling error	0.290	0.191	0.125	0.123	0.080	0.077
Coefficient of variation	15.18 %	13.64 %	12.75 %	12.61 %	12.06 %	11.78 %
Source of Variation	2000/2001					
	12 plant/row	10plant/row	8 plant/row	6 plant/row	4 plant/row	2 plant/row
Experimental error	0.742	0.606	0.267	0.110	0.052	0.041
Sampling error	0.632	0.220	0.114	0.065	0.039	0.039
Coefficient of variation	18.55 %	15.45 %	11.02 %	10.68 %	10.46 %	10.40 %

c- The experimental error as affected by end-border plants.

Table 5 and Fig 3 also present that the values of experimental error variance. These values were 0.805, 0.785, 0.582, 0.461, 0.106 and 0.079 in the first season and it were 0.742, 0.606, 0.267, 0.110, 0.052 and 0.041 in the second season for 12, 10, 8, 6, 4 and 2 plant/row respectively. In the first season these values were reduced from 0.805 to 0.582 and it reduced from 0.742 to 0.267 in the second season with removing the first and the second plant from each end of each row for the cases of 12 and 8 plant/row, respectively. This result indicated that the end-border effects extended to the first and the second plant for all rows and the removal of these plants reducing the experimental error and extended to increase the efficient of the analysis.

d- The coefficient of variation as affected by end-border plants.

Coefficients of variability estimates were also shown in Table 5 and fig 4. These values were 15.18,13.64, 12.75, 12.61, 12.06 and 11.78% in the first season and it were 18.55, 15.45, 11.02, 10.88, 10.46 and 10.40% in the second season for 12, 10, 8, 6, 4 and 2 plant/row, respectively. These values were reduced from 15.18 to 12.75% in the first season and it reduced from

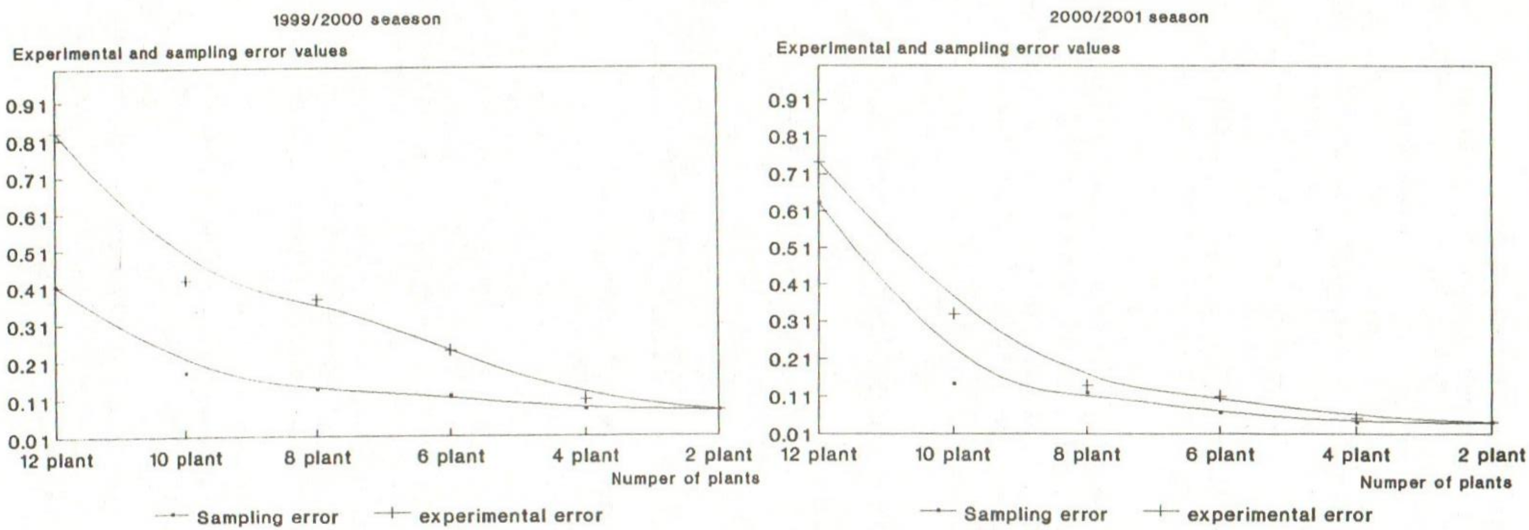

Fig.3:Sampling and experimental errors as affected by eliminating end row plants after discarding the effect of border over all cases that were analyzed in the two seasons.

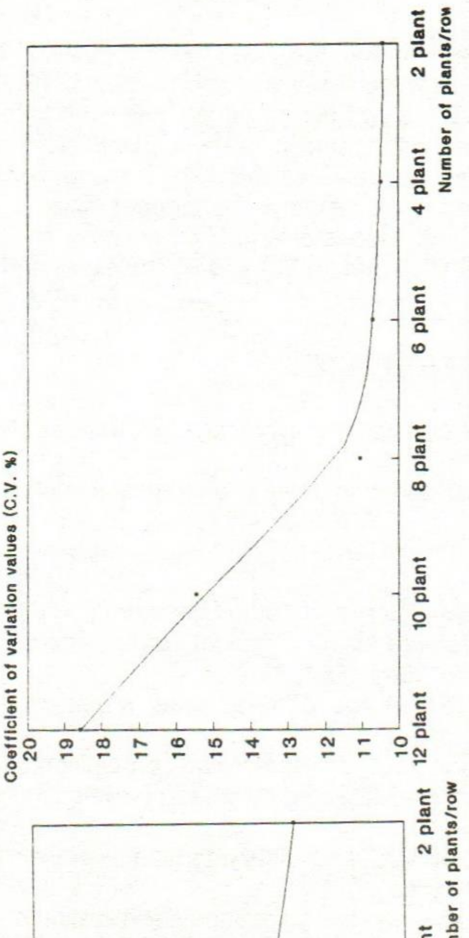

Fig.4: Coefficient of variation as affected by eliminating end plants of the rows over all cases that were analyzed in the two seasons

18.55 to 11.02% in the second season with removing the first and the second plant from each end of each row for the cases of 12 and 8 plant/row, respectively. This result clear that the end-border effects extended to the first and the second plant for all rows and the removal of these plants increase the efficient of the experiment and accuracy of the analysis and would be sufficient to eliminate the most end-border effect in fodder beet trials.

Green (1956), Drapala and Johnson (1961), Hartwig *et al.* (1951), Bhalli *et al.* (1964), El-Rayes (1984), Todd (1988) and El-Taweel (1994) were in agreement with these results.

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تأثير النطاق و نباتات نهايات الخطوط على كفاءة ودقة تجارب بنجر العلف

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* المعمل المركزي لبحوث التصميم والتحليل الإحصائي – مركز البحوث الزراعية – الجيزة – مصر

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يعتبر بنجر العلف محصولا نموذجيا لماشية اللبن وإن تأثير النطاق ونهايات الخطوط (المشايات ونباتات أطراف الخطوط) أحد مكونات الخطأ التجريبي وإن استبعاد الخطوط المجاورة للمشايات ونباتات أطراف الخطوط يمكن أن يستبعد هذا التأثير والهدف من هذه الدراسة هو زيادة دقة التحليل بتعديل محصول الخطوط عن طريق تقليل الخطأ التجريبي لتجارب بنجر العلف بالتحكم فى تأثيرات المشايات ونباتات أطراف الخطوط فى القطع التجريبية المختبرة وقد أقيمت تجربتان حقليتان بمحطة بحوث سدس بمركز البحوث الزراعية بمحافظة بنى سويف خلال عامي ١٩٩٩/٢٠٠٠ ، ٢٠٠٠/٢٠٠١ وقد تم أستخدم أربعة مشايات باتساع ٠,٦ ، ١,٢ ، ١,٨ ، ٢,٤ متر كمعاملات لإظهار هذا التأثير ووزعت تلك المشايات عشوائيا فى وسط كل قطعة تجريبية فى تصميم القطاعات الكاملة العشوائية فى أربع مكررات ولدراسة تأثير النطاق (اتساع المشايات) تم حصاد المحصول المنفرد لكل خط لعدد ستة خطوط من على كل جانب من جانبي المشاية. وقد شمل التحليل الإحصائي كل من ١٢ ، ١٠ ، ٨ ، ٦ ، ٤ ، ٢ خط بعد استبعاد كل من ٢ ، ٤ ، ٦ ، ٨ ، ١٠ خطوط مجاورة لكل جانب من جانبي المشاية على التوالي. ولدراسة نباتات نهايات الخطوط (نباتات الأطراف) تم وزن محصول الجذور لكل نبات على حدة لعدد ١٢ خط فى كل القطع التجريبية. وقد شمل التحليل الإحصائي كلا من ١٢ ، ١٠ ، ٨ ، ٦ ، ٤ ، ٢ نبات فى كل خط بعد استبعاد كل من ٢ ، ٤ ، ٦ ، ٨ ، ١٠ نبات من كل الخطوط فى القطعة على التوالي وقد أمكن تلخيص النتائج كما يلي:

أ- تأثير النطاق (اتساع المشايات) فى تجارب بنجر العلف:

ان تأثير استبعاد محصول الخط الأول والخط الثاني والمجاوران لكلا جانبي نطاق القطع التجريبية (المشايات) على متوسط محصول نبات بنجر العلف الغض وعلى قيمة خطا العينة وعلى قيمة الخطأ التجريبي وكذلك على قيمة معامل الاختلاف وبالتالي على كفاء التجربة ودقة التحليل الإحصائي يمكن تلخيصها كالأتي:

١- انخفض متوسط محصول نبات بنجر العلف الغض من ٢,٧٠٥ ، ٣,٣٣٧ ، ٣,٦٥١ ، ٣,٨٤١ إلى ٢,١٧١ ، ٢,٢٦٨ ، ٢,٢٧٨، ٢,٣١٣، كجم في الموسم الأول بينما انخفض من ٢,٦٤٩ ، ٣,٠٨٧ ، ٣,٤٣٣ ، ٣,٧٦٨ إلى ٢,٢٠٩ ، ٢,٢٩٦ ، ٢,٢٧٨ ، ٢,٢٥٠ في الموسم الثاني بالنسبة للمشايات بعرض ٠,٦ ، ١,٢٠ ، ١,٨٠ ، ٢,٤٠ متر على الترتيب.

٢- انخفضت قيمة تباين العينة من ٥,٦٤١ إلى ٠,٢٢٧ في الموسم الأول بينما انخفضت هذه القيمة من ٦,١٧٨ إلى ٠,٢٧٨ في الموسم الثاني بالنسبة للمشايات بعرض ٠,٦ ، ١,٢٠ ، ١,٨٠ ، ٢,٤٠ متر على الترتيب.

٣- انخفضت قيمة تباين الخطأ التجريبي من ٥,٨٨٤ إلى ٠,٢٣٥ في الموسم الأول بينما انخفضت هذه القيمة من ٤,٧٠٩ إلى ٠,١٦٩ في الموسم الثاني بالنسبة للمشايات بعرض ٠,٦ ، ١,٢٠ ، ١,٨٠ ، ٢,٤٠ متر على الترتيب.

٤- انخفضت قيمة معامل الاختلاف من ٢٠,٣١ إلى ٧,٤٦ % في الموسم الأول بينما انخفضت هذه القيمة من ٢٢,١٨ إلى ٨,٢٦ % في الموسم الثاني.

ومن تلك النتائج يتضح ان تأثير النطاق (المشايات) يمتد إلى الخط الأول والثاني للمشايات في كل قطع التجربة. كما أشارت النتائج أيضا إلى زيادة كفاءة التجربة وكذلك دقة التحليل باستبعاد محصول الخط الأول والخط الثاني من التحليل وان ذلك كان كفيلا باستبعاد معظم تأثير النطاق في تجارب بنجر العلف.

ب: تأثير نهايات الخطوط (نباتات الأطراف) فى تجارب بنجر العلف:

ان تأثير استبعاد محصول النبات الأول والنبات الثاني من كلا طرفي الخط على متوسط محصول نبات بنجر العلف الغض وعلى قيمة خطا العينة وعلى قيمة الخطأ التجريبي وكذلك على قيمة معامل الاختلاف وبالتالي على كفاء التجربة ودقة التحليل الإحصائي يمكن تلخيصها كالأتي:

١- انخفض متوسط محصول نبات بنجر العلف الغض من٣,٨١٦ ، ٣,٥٣٠ ، ٣,٥٣٧ ، ٣,٧٤٥ إلى ٢,٨٤٣ ، ٢,٨٣٧ ، ٢,٨٨٥ ، ٣,٠٨٦ كجم في الموسم الأول بينما انخفض من ٤,٢٣١ ، ٤,٢٤٢ ، ٤,٣٦٤ ، ٤,٣٠٠ إلى ٢,٩٠٢ ، ٣,١٤٥ ، ٢,٩٣٠ ، ٣,١٠٠ في الموسم الثاني بالنسبة للمشايات بعرض ٠,٦ ، ١,٢٠ ، ١,٨٠ ، ٢,٤٠ متر على الترتيب.

٢-انخفضت قيمة تباين العينة من ٠,٢٩٠ إلى ٠,١٢٥ في الموسم الأول بينما انخفضت هذه القيمة من ٠,٦٣٢ إلى ٠,١١٤ في الموسم الثاني بالنسبة للمشايات بعرض ٠,٦ ، ١,٢٠ ، ١,٨٠ ، ٢,٤٠ متر على الترتيب.

٣-انخفضت قيمة تباين الخطأ التجريبي من ٠,٨٠٥ إلى ٠,٥٨٢ في الموسم الأول بينما انخفضت هذه القيمة من ٠,٧٤٢ إلى ٠,٢٦٧ في الموسم الثاني بالنسبة للمشايات بعرض ٠,٦ ، ١,٢٠ ، ١,٨٠ ، ٢,٤٠ متر على الترتيب.

٤-انخفضت قيمة معامل الاختلاف من ١٥,١٨ إلى ١٢,٧٥ % في الموسم الأول بينما انخفضت هذه القيمة من ١٨,٥٥ إلى ١١,٠٢ % في الموسم الثاني.

ومن تلك النتائج يتضح ان تأثير نباتات نهايات الخطوط يمتد إلى النبات الأول والنبات الثاني في كل الخطوط وان استبعاد محصول تلك النباتات يؤدى إلى زيادة كفاءة التجربة وكذلك دقة التحليل وان هذا الاستبعاد هام جدا لتقليل معظم اثر هذه النباتات في تجارب بنجر العلف.