

## VARIABILITY IN FORAGE YIELD OF OATS UNDER MEDIUM RAINFALL OF POTHOWAR TRACT

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### ABSTRACT

Field experiment was conducted to evaluate the performance of 10 forage oats varieties at Barani Agriculture Research Station, Fatehjang in district Attock during winter 2004-05. Significant differences among different varieties were observed for all the traits studied. The exotic oats varieties "Scott" and "Cuscade" produced significantly taller plants, more tillers plant<sup>-1</sup>, higher leaf area and more leaves tiller<sup>-1</sup>. The highest green fodder and dry matter yields of 68.77, 60.19 and 18.82, 16.47 t ha<sup>-1</sup> were obtained in oats varieties "Scott" and "Cuscade", respectively. Hence varieties "Scott" and "Cuscade" proved their superiority over all the other varieties included in the experiment.

**Keywords:** *Avena sativa*, Fodder yield, Oats, Pothowar, Yield Components

### INTRODUCTION

Oats (*Avena sativa* L.) is one of the most important winter fodder crops grown through out Pakistan both under irrigated and rainfed conditions. A well-distributed rainfall of 400 mm and temperature range of 16-32°C during the four months of its growing seasons is sufficient to meet its requirements as a fodder crop (Bhatti *et al.* 1992). It is a quick growing, palatable, succulent and nutritious fodder crop which forms an excellent combination when fed along with other cool season legumes, like berseem or Egyptian clover (*Trifolium alexandrinum*), lucerne or alfalfa (*Medicago sativa*) sengi or Indian clover (*Melilotus indica*), shaftal or Persian clover (*Trifolium resupinatum*), peas (*Pisum arvense*) and vetch (*Vicia sativa*). The improved varieties of oats have potential to produce three-fold green fodder i.e. 60-80 tones per hectare and could feed double the number of animals per unit area as against the traditional fodder crops in the region (Haqqani *et al.* 2003). Hussain *et al.* (1993) reported that out of 15 oats cultivars tested, variety No. 725 produced taller plants, greater number of tillers per plant, more leaves and leaf area, highest green fodder and dry matter yields.

Hussain *et al.* (2002) also found that oats variety Fatua harvested at 50 percent flowering stage produced the highest green fodder and dry matter yields. Ali *et al.* (2003) reported that oats variety "Jasper" significantly produced the highest green fodder and dry matter yields of 70.37 and 17.45 t/ha, respectively. They also reported that oats provide green fodder during the lean period (December, January) when green fodder is scarce and animals are fed with dry fodder, encouraging the oats production in the country. Oats fits well in

existing cropping system of Pothowar region and could provide high quality fodder for livestock. Hussain *et al.* (1998) and Khabhapur *et al.* (1979) evaluated the suitability of oats as a forage crop under different agro-climatic conditions. Hence present study was conducted to determine a suitable, high yielding oats variety for medium rainfall areas of Pothowar tract of Pakistan.

### MATERIALS AND METHODS

Nine varieties of fodder oats viz. Australian, Local from D. I. Khan, Jasper, No. 677, Scott, Cuscade, PD2-LV65, Kent and Local Rawalpindi were compared with standard variety S-2000 at the Barani Agriculture Research Station, Fatehjang in district Attock purely under rainfed conditions (Appendix). The experiment was laid out in a randomized complete block design with three replications keeping a gross plot size of 1.8m x 6m and row spacing of 30 cm. Seed rate of 75 kg ha<sup>-1</sup> of each variety was hand drilled on October 12, 2004 and fertilizer dose of 75-50-00 NPK kg ha<sup>-1</sup> was used at the time of seed bed preparation for sowing. All the cultural practices were kept uniform for all the varieties. At the time of 50% flowering stage, five plants were selected randomly from each plot to take the morphological observation. Parameters studied were: plant height; number of tillers per plant; number of green leaves per main tiller; and leaf area. Net plot size of 1.8m x 6m was harvested for estimation of green fodder yield on ton per hectare basis.

One kg green fodder sample at harvest from each plot was collected at random for dry matter estimation. The samples were weighed, dried in an oven at 60°C for 48 hours and again weighed to

calculate the dry matter yield for each cultivar. The averages of all the data obtained on various parameters were worked out. The data were statistically analyzed using analysis of variance. The data collected were subjected to analysis of variance and LSD Test at 5% probability level to compare the differences among varietal means (Steel and Torrie, 1984).

## RESULTS AND DISCUSSION

Combined analysis of variance for various characteristics of oats is presented in Table-1. Highly significant differences among various oats varieties were observed for all the traits except number of tillers plant<sup>-1</sup> for which differences were found simply significant. Average plant height, number of tillers plant<sup>-1</sup>, number of green leaves tiller<sup>-1</sup>, leaf area, green fodder yield and dry matter yield of different oats varieties are presented in Table-II.

### Plant Height

Differences among various oats varieties for plant height were highly significant. Varieties Scott (183.9 cm) and Cuscade (178.0 cm) produced the highest and similar plants in height. Variety PD2-LV65 (171.9 cm) was at par with that of variety Cuscade in plant height. Oats varieties Local Rawalpindi, No. 677 and Local D. I. Khan recorded the lowest and similar plant heights of 139.7, 144.5 and 147.0 cm, respectively. These findings are in accordance with those of Hussain *et al.* (1993 and 2005) in which they studied different exotic oats varieties under different agro-climatic conditions.

### Number of Tillers Plant<sup>-1</sup>

Number of tillers plant<sup>-1</sup> play a vital role in enhancing fodder yield. There were significant differences among various cultivars of oats for number of tillers plant<sup>-1</sup>. Table 2 indicates that oats varieties Cuscade, Scott, Local D. I. Khan, Local Rawalpindi, No. 677 and Australian produced the maximum and statistically at par number of tillers plant<sup>-1</sup>. Variety PD2-LV65 was at par with that of varieties Scott, Local D. I. Khan, Local Rawalpindi, No. 677 and Australian but different with that of Cuscade in the production of tillers plant<sup>-1</sup>. The lowest and similar tillers plant<sup>-1</sup> were observed in varieties Jasper, S-2000 and Kent (4.67, 5.22 and 7.22, respectively). These results are in agreement with those of Khabhapur *et al.* (1979).

### Number of leaves tiller<sup>-1</sup>

Highly significant differences were found among various cultivars of oats for number of leaves tiller<sup>-1</sup>. It was observed that oats varieties Scott (6.77) and Cuscade (6.33) produced the highest and similar number of leaves tiller<sup>-1</sup> (Table 2). Varieties Local Rawalpindi and PD2-LV65 were similar with that of variety Cuscade and different with Scott in leaves tiller<sup>-1</sup> production. All the other varieties recorded minimum and similar leaves tiller<sup>-1</sup>. These results are in agreement with those of Hussain *et al.* (2005) and Bhatti *et al.* (1992).

### Leaf Area

Table 2 reveals that the differences among various cultivars of oats for leaf area were statistically highly significant. Oats variety Scott produced the highest (156.40 cm<sup>2</sup>) and statistically different leaf area from all the other cultivars. Varieties Australian, Jasper, S-2000, Cuscade and PD2-LV65 were similar with each others and different from variety Scott in leaf area. Variety Local D. I. Khan recorded the lowest leaf area of 79.13 cm<sup>2</sup>.

### Green Fodder Yield (t ha<sup>-1</sup>)

Significant differences were observed among various oat varieties for green fodder yield. The oats cultivar Scott and Cuscade produced the highest and similar green fodder yields (68.77 and 60.19 t ha<sup>-1</sup>). Varieties Australian, Jasper, No. 677, S-2000, and PD2-LV65 were similar with each other, at par with that of Cuscade but different from Scott in green fodder yields. Cultivars Local D. I. Khan and Kent were similar with each other but different from Australian, Jasper, No. 677, S-2000, and PD2-LV65 in green fodder production. Variety Local Rawalpindi recorded the lowest green fodder yield (45.83 t ha<sup>-1</sup>). Hussain *et al.* (1993, 1998 and 2005); Ali *et al.* (2003) and Bhatti *et al.* (1992) reported similar results in various investigations.

### Dry Matter Yield (t ha<sup>-1</sup>)

There were also significant differences among various oat varieties for dry matter yield. Varieties which recorded the highest green fodder yields also produced the highest dry matter yields. The oats cultivars Scott, Cuscade and No. 677 produced the highest and similar dry matter yields (18.82, 16.47 and 15.97 t ha<sup>-1</sup>, respectively). Varieties Australian, Jasper, and PD2-LV65 were similar with each other, at par with that of Cuscade and No. 677 but different from Scott in dry matter yield. Cultivars Local Rawalpindi, Kent and Local D. I. Khan produced the lowest and similar dry matter yields. Hussain *et al.* (1993 and 1998); Ali *et al.* (2003)

and Bhatti *et al.* (1992) also reported similar results in various investigations.

### CONCLUSION

It was concluded from the above results and discussion that oats varieties Scott and Cascade had superiority over all the other varieties due to

the fact that they produced significantly more plant height, number of tillers plant<sup>-1</sup>, number of leaves tiller<sup>-1</sup>, leaf area and ultimately the highest green fodder and dry matter yields. High fodder yield in varieties Scott and Cascade might be due to the fact that these varieties were late maturing and remained green till April (Table II).

**Table-I:** Analysis of Variance for Various Characters of Oat Varieties

SOV	DF	Mean Squares					
		PH	TP	LT	LA	GFY	DMY
Replications	2	125.58	1.186	0.639	85.432	1.929	0.079
		**	*	**	**	**	**
Varieties	9	637.699	4.182	0.779	1802.561	143.170	10.223
Error	18	36.690	1.384	0.203	63.294	36.180	2.788

\* and \*\* Significant at 5% and 1% level of probability, respectively.

PH, TP, LT, LA, GFY and DMY denote plant height, number of tillers per plant, number of leaves per tiller, leaf area, green fodder yield and dry matter yield, respectively.

**Table-II:** Mean Days to Flowering, Plant Height, Tillers/plant, Leaves/tiller, Leaf area, Green fodder yield and Dry Matter yield of various varieties of oats At Barani Agriculture Research Station, Fatehjang.

Varieties	Days to Flowering	Plant Height (cm)	Tillers Plant <sup>-1</sup>	Leaves tiller <sup>-1</sup>	Leaf Area (cm <sup>2</sup> )	Green Fodder Yield (t ha <sup>-1</sup> )	Dry Matter Yield (t h <sup>-1</sup> )
Australian	120	156.00cd	6.61abcd	5.37cd	124.30 b	55.60 bcd	15.44bcd
Local D. I. Khan	138	147.00def	8.27ab	5.33cd	79.13 e	48.15 cd	13.29cd
Jasper	147	158.75c	4.67e	5.50cd	121.80 b	51.39 bcd	14.37bcd
No. 677	131	144.50ef	7.11abc	5.53cd	93.23 cd	57.53 bc	15.97abc
S-2000	127	156.33cd	5.22de	5.12d	123.90 b	50.93 bcd	14.14bcd
Scott	148	183.90a	8.28ab	6.77a	156.40 a	68.77 a	18.82a
Cascade	147	178.00ab	8.35a	6.33ab	124.10 b	60.19 ab	16.47ab
PD2-LV65	132	171.92b	6.55bcd	5.83bcd	125.00 b	55.09 bcd	15.16bcd
Kent	123	154.50cde	6.22cde	5.42cd	95.50 c	47.69 cd	12.97d
Local Rawalpindi	123	139.67f	7.22abc	5.92bc	79.94 de	45.83 d	12.84d
LSD (0.05)		10.39	1.75	0.77	13.65	10.32	2.86

**Temperature (°C), Mean Relative Humidity (%) and Rainfall (mm) of Experimental Site during the Growth Period of Oats Crop.**

Period	Temperature		Mean Relative Humidity (RH)	Rainfall
	Mean			
	Maximum	Minimum		
September, 2004	35	23	72	10
October, 2004	27	16	72	65
November, 2004	24	11	76	15
December, 2004	18	8	87	15
January, 2005	14	5	78	98
February, 2005	18	7	98	168
March, 2005	22	12	80	115
April, 2005	28	18	59	5
May, 2005	32	22	51	27
June, 2005	39	27	50	31

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