

Performance of Different Oat (*Avena sativa* L.) Varieties Under the Agro-climatic Conditions of Bahawalpur–Pakistan

NAZAKAT NAWAZ, ABDUL RAZZAQ†, ZULIFAQAR ALI‡, G. SARWAR¶ AND M. YOUSAF[]
Oilseeds Program, †Rangeland Research Program, ‡Fodder Program and ¶Honeybee Research Institute, NARC, Park Road, Islamabad–Pakistan
[*Arid Zone Research Institute, Bahawalpur–Pakistan*]

ABSTRACT

An investigation to evaluate the performance of different oat varieties (Tibor, Scott, PD2LV65, Sargodha 81 and Swan) was conducted at Arid Zone Research Institute, Bahawalpur. It was observed that days to anthesis, days to maturity, number of seeds per tiller, number of tillers per plant, 1000 grain weight, plant height, fodder yield, grain yield and dry matter yield were significantly different in all varieties. The results revealed that PD2LV65 gave the maximum fodder yield (14160 kg ha⁻¹), grain yield (2435 kg ha⁻¹) and dry matter yield (1900 kg ha⁻¹). Hence, PD2LV65 proved to be the best variety among five varieties included in the study under the agro-climatic conditions of Bahawalpur (Pakistan).

Key Words: *Avena sativa*; Oat; Pakistan

INTRODUCTION

Oats (*Avena sativa* L) is one of the most important rabi cereal fodder crop grown in winter throughout Pakistan both under irrigated and rainfed conditions. A well distributed rainfall of 400 mm and an optimum temperature range of 16–32°C during the four months duration is sufficient to meet its requirement as a fodder crop. It is a quick growing, palatable, succulent and nutritious fodder crop. The oat is a multicut fodder, which can play a pivotal role in establishing a more productive dairy industry in the country. The improved varieties of oats produce three-fold green fodder i.e. 60–80 tones per hectare and can feed double number of animals per unit area as against the traditional fodder crops. The oats varieties have already been developed possessing characteristic i.e. early to late duration, high yielding, more nutritious, palatable, multicut and disease free varieties for various agro-ecological zones. Oat is a cold and drought tolerant crop and it provide green fodder during the lean period (December, January) when green fodder is scarce and animals are fed with dry fodder.

Genotype x environment interaction remained always a serious problem in crop production while recommending a variety for some region/area. Environment for commercial cultivation cannot be changed but genotype can be modified by hybridization and bio-tech methods to suit to available soil and climate related environmental conditions. For this purpose, breeders are always collecting and creating genetic variability in crops for development of varieties suitable for diverse agro-climatic zones. One cultivar cannot be grown all over the country having multitude of environments. Crop outcome is a product of the genotype and the environment in which crop has been grown. Ideal variety is always one,

which possesses general adaptation with higher yield potential (Finlay & Wilkinson, 1963).

No systematic research work appears to have been conducted on oat for its utility as a fodder crop in Pakistan but the results of Dhumale and Mishro (1979) shown that fresh fodder yields were positively correlated with plant height, leaf area and number of tillers/plant. Bhatti *et al.* (1992) evaluated that among 12 oat cultivars, PD2-LV65 and Sargodha-81 were found superior than other cultivars by producing taller plants, more tillers/plant and leaf area. So, their results indicated that the cultivars PD2LV65 and Sargodha 81 produced 28.05 and 26.24% more green fodder yield and 26.30 and 21.93% more dry matter yield, respectively as compared with check variety. Solanki (1977) reported that the new cultivar 'HFO-114' is excellent significantly both in green fodder and dry matter yields in single as well as multicut trials than the check varieties Weston-11 and FOS-1/29. Toxler *et al.* (1980) reported that oats when grown as a fodder crop, cultivar 'Borris' yield 26 and 60% more dry matter when grown alone and in a mixture, respectively. Reddy and Rai (1977), Khabkapur *et al.* (1979), Riveland *et al.* (1977), Chaudhary (1983) and Chaudhary *et al.* (1985) have evaluated the suitability of oats as a forage crop under different agro-climatic conditions. This study aimed to introduce the oat as a green fodder crop among the farmers of Bahawalpur area.

MATERIALS AND METHODS

A field experiment on performance of five oat varieties was conducted under the irrigated conditions at Arid Zone Research Institute, Bahawalpur during the year 1999. Varieties included in the study were Tibor, Scott, PD2LV65, Sargodha 81 and Swan. The experiment was laid out in a Randomized Complete Block Design (RCBD)

with three replications using a plot size 6x3 m. Fertilizers at the rate of 50-50 kg NP ha⁻¹ were applied. Whole phosphorus and half nitrogen were applied at the time of seed bed preparation in the form of di-ammonium phosphate (DAP) and urea, respectively. Whereas, remaining half of nitrogen was applied at the time of first irrigation. Ten plants were selected at random from each plot to record individual plant observation viz. plant height, number of seeds per tiller, number of tillers per plant, 1000-grain weight, green fodder yield, grain yield and dry matter yield. First cutting from each plot was taken after 70 days of planting. A net area of 1.8x6 m was harvested from each plot for estimation of green fodder yield during both cutting. One kilogram green fodder sample at harvest from each plot was collected at random for dry matter estimation. The samples were weighed to calculate the dry matter yield on the basis of total green fodder yield for each cultivar. All other agronomic practices were applied uniformly during the course of study. The data collected were analyzed statistically by Fisher's analysis of variance technique and treatment means were compared using Least Significant Difference (LSD) test at 5% level of probability (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

The data on various parameters recorded in the study have been presented in Table I.

Cultivar Sargodha 81 took maximum days (150.33) to attain anthesis stage which was statistically at par with Scott which took 149.33 days followed by Tibor (143.67 days). Cultivar Swan got significantly minimum days (133.33) to reach at anthesis stage. Days taken to anthesis in the varieties are different probably due to their varietal characteristics and adaptability.

There were significant differences among oat varieties in respect of days to taken to maturity. The genotype Scott got maximum days (210) to reach at maturity but statistically at par with genotypes Sargodha 81 (205 days). The genotype Swan took the minimum number of days (179) to attain maturity stage. Significant differences in days taken to maturity among different varieties may be due the genetic make up or adaptability.

Plant height data indicated that there were significant differences in plant height among all oat varieties.

Maximum plant height (162 cm) was observed in variety Scott followed by Sargodha 81 (154.33 cm) and variety PD2LV65 showed the minimum plant height (141.67 cm).

There were significant differences in the number of seeds per tiller among the cultivars. Maximum number of seeds per tiller (80) were produced by Swan followed by PD2LV65 and Sargodha 81 having 75 and 72 seeds per tiller, respectively. Among the tested varieties, Tibor attained fourth position by giving 61 seeds per tiller which was followed by Scott having 60 seeds per tiller. Highest number of seeds per tiller (80) in Swan variety might be due to its genetic character and best adaptation to local conditions as compared to other varieties.

There were significant differences among the number of tillers per plant of different genotypes. Highest number (13) of tillers per plant were found in PD2LV65 followed by Sargodha 81 and Swan having 11 and 10 tillers per plant, respectively. Lowest number (7) of tillers per plant was observed in Tibor. Number of tillers per plant plays a vital role in enhancing the green fodder yield. Bhatti *et al.* (1992) evaluated that among 12 oat varieties, PD2LV65 and Sargodha 81 were found superior than other tested varieties by producing taller plants and more number of tillers per plant.

There were significant differences among 1000 grain weight of five oat varieties. Oat variety Swan produced maximum 1000 grain weight (36.60 g) followed by Tibor and PD2LV65 having 34.60 and 29.47 g, respectively. Minimum 1000 grain weight (27.00 g) was observed in oat variety Scott.

There were significant differences in the grain yield of five oat varieties. It is evident from the data that maximum grain yield (2435 kg ha⁻¹) was produced by variety PD2LV65 followed by varieties Swan and Tibor which produced grain yields (2403 and 1105 kg ha⁻¹), respectively. Oat variety Scott produced minimum grain yield (810 kg ha⁻¹). These results are also confirmed by Finlay and Wilkinson (1963), who reported that yield of cultivars is influenced by adaptability.

There were significant differences in fodder yields of five different oat varieties. Maximum fodder yield (14160 kg ha⁻¹) was produced by the variety PD2LV65 and next to follow was Scott, which gave 13830 kg ha⁻¹ but these were statistically at par. These were followed by varieties Swan and Sargodha 81 which gave the fodder yield 11230 and

Table I. Performance of different oat varieties under the agro-climatic conditions of Bahawalpur

Variety	Days to anthesis	Days to maturity	Plant height (cm)	No. of seeds/tiller	No. of tillers/plant	1000 grain weight (g)	Grain yield (kg ha ⁻¹)	Fodder yield (kg ha ⁻¹)	Dry matter yield (kg ha ⁻¹)
Tibor	143.67b	197b	143.33d	61bc	7ab	34.60a	1105b	7060c	1180b
Scott	149.33a	210a	162 a	60bc	9a	27b	810c	13860a	1800a
PD2LV65	135.33c	186c	141.67d	75a	13a	29.47b	2435a	14160a	1900a
Sargodha 81	150.33a	205a	154.33b	72ab	11a	28.13b	1100b	10730b	1360b
Swan	133.33d	179b	148.33c	80a	10a	36.60a	2403a	11230b	1470ab
LSD(0.05)	1.46	13.81	3.82	6.44	5.08	3.25	143.3	1453.6	335.8

10730 kg ha⁻¹, respectively. Whereas, the minimum (7060 kg ha⁻¹) fodder yield was produced by the variety Tibor. Reddy and Rai (1977), and Riveland *et al.* (1977) have evaluated the suitability of oats as a forage crop under different agro-climatic conditions.

Variety PD2LV65 produced the highest dry matter yield (1900 kg ha⁻¹) and next to follow was variety Scott which gave 1800 kg ha⁻¹ but these were statistically at par. These two varieties were followed by Swan and Sargodha 81 which gave the dry matter yield 1470 and 1360 kg ha⁻¹, respectively but these were also statistically at par. Whereas, the lowest dry matter yield (1180 kg ha⁻¹) was obtained by the variety Tibor. Bhatti *et al.* (1992) who evaluated that among 12 oat varieties PD2LV65 and Sargodha 81 were found superior than other cultivars by producing taller plants, more number of tillers per plant and leaf area. They reported that cultivars PD2LV65 and Sargodha 81 produced the 28.05 and 26.24% more green fodder yield (kg ha⁻¹) and 26.30 and 21.93% more dry matter yield (kg ha⁻¹), respectively as compared to check variety.

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