

PERFORMANCE OF HIGH YIELDING OAT VARIETIES UNDER AGRO-ECOLOGICAL CONDITIONS OF D. I. KHAN

Qamar-uz-Zaman, Malik Nazir Hussain, Abdul Aziz^{*}
and Khizar Hayat^{**}

ABSTRACT

Twelve cultivars of oats were evaluated for different yield components at Agricultural Research Institute, D. I. Khan, during 2003-2004. It was observed that varieties differed significantly in plant height, leaf area, fresh fodder and dry matter yield while non-significantly in number of tillers per plant and number of leaves per tiller. The results further revealed that variety Jasper produced maximum fodder (43.5 t/ha) and dry matter yield (8.77 t/ha). No. 677 ranked second in green fodder yield. Hence, Jasper and No. 677 proved to be the best varieties under agro-climatic conditions of D. I. Khan.

KEYWORDS: *Avena sativa*; high yielding varieties; performance; agronomic characters; Pakistan.

INTRODUCTION

Oats (*Avena sativa* L.) is one of the most important rabi cereal fodder crops grown in Pakistan under irrigated and barani conditions. A well distributed rainfall of 400 mm and an optimum temperature range of 16-32°C during four months duration is sufficient to meet its requirement as a fodder crop. It is quick growing palatable, succulent and nutritious crop. The improved varieties of oats produces 60-80 tons per hectare green fodder and can feed double number of animals per unit area as against the traditional fodder crops. Oats form an excellent combination when fed alongwith other cold season legumes like berseem, lucerne (Alfalfa), senji (Indian clover), shaftal (Persian clover) and pea (*Pisum arvense*) or vetch (*Vicia sativa*). Oats fodder is mostly fed as green but surplus is converted into silage or hay to use during fodder deficit period. It is favourite feed of all animals and its straw is soft and superior to wheat and barley. The oats grain is also valuable feed for horses, dairy cows, poultry and young breeding animals.

^{*}Scientific Officers, ^{**}Millet Botanist, Agricultural Research Institute, D. I. Khan, NWFP, Pakistan.

Oats is high in DN protein, fat, vitamin B1 and minerals as phosphorus and iron. The average green fodder yield of oats is 20 tons per hectare (2) which is very low and insufficient to maintain ration to the animals. The farmers face fodder deficiency in winter when they have only dry stalks of kharif cereal fodder or dry summer grasses. So they have to purchase costly oats fodder transported from far flung irrigated areas of the country.

With the introduction of new high yielding oats varieties, the farmers in NWFP increasingly recognized oats as important rabi fodder for filling the fodder gap. Habib *et al.* (6) evaluated ten oats varieties for green fodder yield and nutritive quality and concluded that Avon and PD₂LV₆₅ excelled all other varieties in green fodder, dry fodder yield and days to maturity. Bhatti (3) reported that per hectare fodder yield could be increased 2-3 fold by adopting improved varieties and agronomic practices. Chaudhry and Mukhtar (4) evaluated six oats varieties and reported that Avon, PD₂LV₆₅ and Sargodha-81 outyielded the check variety in fodder yield potential.

Nawaz *et al.* (7) evaluated five oats varieties and concluded that days to anthesis, days to maturity, number of seeds per tiller, number of tiller per plant, 1000-grain weight, plant height, green fodder yield and dry fodder yield were significantly different in all varieties.

Bhatti *et al.* (2) concluded that among 12 oats cultivars PD₂LV₆₅ and Sargodha-81 were superior to other cultivars with taller plants, more tillers per plant, green fodder yield and dry matter yield.

Amanullah *et al.* (1) reported that variety Steel gave maximum fresh forage yield (131 t/ha) followed by variety Jasper (128 t/ha) while maximum dry forage yield (35 t/ha) was recorded for variety Local Sheikhpura. Salam and Hatam (9) evaluated 17 oats varieties for fresh and dry matter yield and other quantitative characters. They reported that varieties Coolabah and Java Lahori produced higher forage yield (37 and 34 t/ha) as compared to other varieties. Hussain *et al.* (5) studied yield and quality components of 15 exotic and indigenous varieties of oats. They reported that highest mean fresh forage and dry matter yields were obtained from variety PD₂LV₆₅ while variety No. 681 had higher crude fibre content. Kim and Seo (8) reported that high yielding varieties tended to attain plant height with broader leaves and fewer tillers than low yielding varieties.

The present study was conducted to compare the yield of different improved varieties of oats for meeting fodder requirements of ruminant livestock under climatic conditions of D. I. Khan.

MATERIALS AND METHODS

Twelve improved varieties of oats viz. Australian, Jasper, Scott, PD₂LV₆₅, S-2-000, Local Sheikhpura, No. 677, No. 708, Local Sariab, Local Tandojam and Local D. I. Khan as check were planted at Agricultural Research Institute, D. I. Khan during 2003-04. Layout system was randomized complete block design with three replications. Plot size was 5 x 8 meter with line spacing of 30 cm. Seed rate used was 75 kg per hectare. Nitrogen and phosphorus fertilizers (75-50 kg/ha) were applied at sowing time. The crop was harvested at 50 percent flowering stage. Data were recorded on plant height, number of tillers per plant, number of leaves per tiller, leaf area, fresh fodder yield and dry matter yield.

Plant height was measured in centimeters from base to tip of the plant by selecting ten plants at random from each variety at 50 percent flowering and then average was worked out. Similarly leaves per tiller were counted in each variety. Leaf area was calculated by using the following formula:

$$\text{Leaf area (cm}^2\text{)} = \text{Leaf length (cm)} \times \text{leaf width (cm)} \times 0.75.$$

For fresh fodder yield, central 4 rows were harvested at 50 percent flowering and weighed. The material was sun-dried to record dry matter yield. The data were statistically analyzed according to the procedure appropriate to design and means were compared using LSD procedure (10).

RESULTS AND DISCUSSION

1. Fodder yield

Both green fodder and dry matter yields of oats significantly varied due to varieties which averaged 34.97 and 6.47 tons per hectare, respectively (Table 1). Maximum green fodder yield (43.51 t/ha) was obtained from variety Jasper and it was minimum (28.70 t/ha) in PD₂LV₆₅. The green fodder yields of remaining varieties were comparable (31.01-39.88 t/ha). These results are in conformity with those of some earlier workers (4, 6, 7) who reported that oats varieties differ in green and dry matter yields.

Table 1. Green fodder and dry matter yields of different oats varieties

S. No.	Varieties	Green fodder yield (t/ha)	Dry matter yield (t/ha)
1	Jasper	43.51a	8.77a
2	No. 677	39.88ab	6.29bc
3	No. 681	36.11bc	6.29bc
4	Scott	35.93bc	7.31ab
5	Local Tando Jam	35.64bc	7.26ab
6	Local D. I. Khan (check)	35.18bcd	6.01bc
7	Australian	35.18bcd	6.15bc
8	No. 708	33.79bcd	5.64bc
9	Local Sariab	32.86cd	6.47bc
10	Local Sheikhpura	31.94cd	6.15bc
11	S-2000	31.01cd	6.11bc
12	PD ₂ LV ₆₅	28.70d	5.27c
	Mean	34.97	6.47
	LSD (5%)	6.88	1.71
	CV%	11.62	15.61

Mean values in the same column carrying similar letter(s) do not differ significantly at 5% level of probability.

The results of dry matter yield were also similar in trend. Variety Jasper produced maximum (8.77 t/ha) dry matter yield followed by Scott (7.31 t/ha) and Local Tandojam (7.26 t/ha). No significant differences in dry matter yield were observed in remaining varieties which suggest that fodder yield could be increased by using seeds of improved varieties. Hussain *et al.* (5) also reported that fresh forage yield differed due to differences in leaves per tiller and plant height. The variation in dry matter yield of varieties may be attributed to genetic characteristics and adaptability of these varieties to different environmental conditions.

2. Plant height

The data (Table 2) revealed that cultivars Jasper and Scott produced significantly taller plants than other varieties. The tallest plants (130-cm) were produced by Jasper followed by Scott (126.6 cm). The check variety Local D. I. Khan had 111.6 cm plant height. Minimum plant height (111.3 cm) was produced by variety No. 677. The variation in plant height could be due to genetic make-up of the varieties. Environmental conditions caused variation in hormonal balance and cell division rate that resulted in change of different

varieties. Kim and Seo (8) reported that high yielding varieties of oats tended to gain more plant height than low yielding varieties.

3. Number of tillers per plant

There were no significant differences in number of tillers per plant of different varieties (Table 2). However, the highest number of tiller per plant(12.5) was obtained in Jasper followed by Australian (11.5) and Local Tandojam (11.4). The lowest number of tillers per plant (9.4) was recorded in No. 677. Number of tillers per plant played a vital role in enhancing the green fodder yield. Similar results were reported by Amanullah *et al.* (1).

Table 2. The values of morphological characteristics of different oat varieties

S. No.	Varieties	Plant height (cm)	No. of tillers/plant	No. of leaves/plant	Leaf area (cm ²)
1	Jasper	130.01a	12.5	6.8	132.04a
2	No. 677	111.3ef	9.4	6.6	125.42abc
3	No. 681	114.6de	11.0	6.7	123.75abc
4	Scott	126.6ab	9.9	6.4	125.49abc
5	Local Tando Jam	124.3abc	11.4	6.9	126.17abc
6	Local D. I. Khan (check)	111.6def	10.4	6.8	122.00bcd
7	Australian	118.3cde	11.5	6.3	128.16ab
8	No. 708	104.6f	10.8	6.5	121.52bcd
9	Local Sariab	114.6de	10.0	6.8	119.68bcd
10	Local Sheikhpura	120.00bcd	9.7	6.4	122.12bc
11	S-2000	114.00de	10.4	6.6	117.12cd
12	PD ₂ LV ₆₅	118.00cde	9.7	6.4	112.52d
	LSD(5%)	8.64	NS	NS	9.59
	CV%	4.35	11.38	5.6	4.61

Mean values in the same column carrying similar letters do not differ significantly at 5% level of probability. NS = Non-significant at 5% level of probability using LSD test.

3. Number of leaves per tiller

Statistical analysis of the data showed that differences in leaves per tiller of different varieties were non-significant. However, Local Tandojam produced 6.9 leaves per tiller. The leaves per tiller of different varieties ranged from 6.3 to 6.9 (Table 2). Jasper variety possessed 6.8 leaves per tiller and taller plants. Both the characters seem to be interrelated. These observations are in close conformity with Amanullah *et al.* (1).

4. Leaf area

The results (Table 2) revealed that differences in leaf area were statistically significant. Maximum leaf area (132.04 cm²) was recorded for variety Jasper followed by variety Australian (128.16 cm²) while minimum leaf area (112.52 cm²) was recorded for variety PD₂LV₆₅. Check variety Local D. I. Khan produced a leaf area of 122 cm². Kim and Seo (8) also reported that high yielding varieties tended to be upright with broad leaves than low yielding varieties. The variation in leaf area may also be attributed to variation in genetic make-up and adaptability of these varieties to different environmental conditions.

REFERENCES

1. Amanullah, P. S., K. Zada and S. Perveen. 2004. Growth characters and productivity of oat varieties at Peshawar. *Sarhad J. Agric.* 20(1):5-10.
2. Bhatti. M. B., A. Hussain and D. Muhammad. 1992. Fodder production potential of different oat cultivars under two cut systems. *Pak. J. Agric. Res.*(2) 13:184-190.
3. Bhatti, B. 1996. Fodder production in rainfed areas of Punjab. *Fodder Production in Pakistan*. PARC. p. 113-114.
4. Chaudhry, M. H. and M. A. Mukhtiar. 1985. Performance of three new fodder high yielding varieties of oats. *Pak. J. Agric. Res.* 6(3):218-222.
5. Hussain, A., S. Khan, D. Muhammad and M. B. Bhatti. 1993. Yield and quality of various varieties of oats. *Pak. J. Sci. Ind. Res.* 36(6-7):258-260.
6. Habib, G., T. Ahmad, I. Saba and N. Akhtar. 2003. Genotype variation in the yield and nutritive quality of oats fodder. *Sarhad J. Agric.* 19(4):419-422.
7. Nawaz, N., A. Razzaq, Z. Ali and M. Yousaf. 2004. Performance of different oat (*Avena sativa* L.) varieties under the agro-climatic conditions of Bahawalpur-Pakistan. *Int. J. Agric. Biol.* 1560-8530/2004/06-4: 624-626.
8. Kim, D. A. and S. Seo 1988. Comparative study of introduced oats for forage production, growth characteristics and yield of spring oats. *Korean J. Anim. Sci.* 30(4):269-275.

9. Salam, A. and M. Hatam. 1999. Evaluation of Fodder Oat Cultivars. M.Sc. (Hons). Thesis, Deptt. of Agron; NWFP. Agric. Univ., Peshawar.
10. Steel, R.G.D. and J. H. Torrie. 1980. Principles and Procedures of Statistics. A Biometrical Approach 2nd Ed: McGraw Hill, New York. p. 232-349.

