Forage Res., **39** (4) : pp. 197-200 (2014) **http://forageresearch.in**

EXPLORING THE SEED PRODUCTION POTENTIAL IN OAT (*AVENA SATIVA* L.)

R. N. ARORA*

Forage Section, Department of Genetics & Plant Breeding
CCS Haryana Agricultural University,
Hisar-125 004, India
**(e-mail : arora15@rediffmail.com)*
(Received : 4 February 2014; Accepted : 20 March 2014)

SUMMARY

Single cut oat genotypes OS 6 (36.1 q/ha) and OS 363 (33.3 q/ha) and dual type oat genotypes RJB-1 (40.7 q/ha) and UPO 05-1 (25.9 q/ha), UPO 212 and OS 6 (25.9 q/ha) ranked first and second, respectively, for seed yield at CCSHAU, Hisar, whereas at All India level, single cut genotypes UPO 09-1 (23.7 q/ha) and OS 6 (23.0 q/ha) and dual type genotypes RJB-1 (40.7 q/ha), UPO 05-1 (25.9 q/ha), UPO 212 and OS 6 (25.9 q/ha) stood first and second, respectively. Seed yield averaged over five seasons (2007-08 to 2011-12) at nine different locations across the country showed that highest seed yield in oats was obtained at Hisar in Haryana, N-W Zone (28.8 q/ha), at Kanke, Ranchi in Jharkhand, N-E Zone (28.7 q/ha) and at Srinagar in J & K, Hill Zone (28.3 q/ha), followed by Jabalpur in Madhya Pradesh and Jhansi in Uttar Pradesh, in Central Zone (24.4 q/ha) as compared to national average of 22.0 q/ha, emphasizing thereby that the climatic conditions of these locations are highly suited for harnessing higher oat seed production. It was concluded that the seed production from the crop after taking one cut of green fodder was almost comparable with the seed production taken from a crop where no cut of green fodder was taken.

Key words : Single cut, dual type, seed production, oat

Oat (*Avena sativa* L.) is widely cultivated for use as food, feed and fodder. The bulk of the oats produced in the world are used extensively as feed for livestock (cattle, sheep, poultry and horses) and only 17 per cent of the world production (grain) is used as human food. In India, it is mainly grown in North-western, Central and Hilly parts due to congenial climatic conditions for its growth (Sharma *et al.*, 2001). Its fodder is rich in energy, protein, vitamin B, phosphorus and iron (Mehra, 1978). Contents of β-glucan, minerals, antioxidants, hormone analogs in oat groats are unique in composition and quality amongst the cereal grains (Welch *et al.*, 2000; Peterson, 2001). Health promoting effects of oat products for human consumption have been approved by the American Food and Drug Association (1996). Fiber in oats reduces serum cholesterol and helps to promote a more normal blood glucose level in diabetics and is considered to be as healthy food. The protein content of oats grain (10.5%) similar to that of barley and maize and oat protein has a relatively well balanced amino acid composition. Seed production in oat is not a constraint, but one can employ two options for taking the seed production programme from oat crop. Either grow multi-cut oat, take one cut of fodder at about 55-60 DAS and take the seed production from the regenerated crop or take the seed production without taking any fodder harvest. In the present studies, efforts have been made to compare fodder/seed production potential in single-cut/two cut oats (dual type) and to identify the best location for higher seed production in oats.

MATERIALS AND METHODS

The following experiments/trials were conducted to generate data for fodder and seed yield in oats :

Experiment 1

In this experiment, eight genotypes of "single cut" oat contributed by various coordinating centres under All India Coordinated Research Project on Forage Crops were tested against two national checks, namely, Kent and OS 6 for assessing the fodder and seed yield

potential in two separate trials during **rabi** 2011-12. One trial was harvested for fodder at 50 per cent flowering stage, whereas the other trial was conducted for taking seed production only. The fodder and seed yield obtained at Hisar was compared with the average fodder and seed yield obtained at All India level (Table 1).

Experiment 2

In this experiment, nine genotypes of "dual type" oat contributed by various coordinating centres under AICRP (FC) were tested against four national checks, namely, Kent, OS 6, UPO 212 and JHO 822 for assessing the fodder and seed yield potential in the same experiment during **rabi** 2011-12. Here, the trial was harvested for fodder yield at 55-60 days after sowing and seed yield was taken from the regenerated crop. The fodder and seed yield obtained at Hisar was compared with the average fodder and seed yield obtained at All India level (Table 2).

TABLE 1

Comparative performance of single cut oat genotypes for seed and fodder yield during **rabi** 2011-12

S. No.	Genotypes	Seed yield (q/ha)				GFY (q/ha)				DMY (q/ha)			
		Hisar	R	All India	R	Hisar	R	All India	R	Hisar	R	All India	R
1.	SKO 148	6.4	8	15.3	8	305.4	8	380.5	10	67.2	10	85.7	9
2.	SKO 156	12.5	7	15.3	8	397.1	6	434.1	4	71.5	9	92.1	7
3.	JHO 2009-1	27.8	3	21.1	5	597.0	1	452.7	1	119.4	1	93.4	4
4.	JHO 2009-2	20.0	5	19.1	7	444.3	3	441.6	3	106.6	3	95.9	2
5.	OS 363	33.3	2	21.6	4	472.0	2	420.9	7	113.3	2	94.2	3
6.	UPO 09-1	27.8	3	23.7	1	444.3	3	449.3	2	100.8	4	98.6	1
7.	UPO 09-2	27.8	3	20.2	6	402.6	5	428.8	5	80.5	7	92.5	6
8.	JO 03-95	19.4	6	19.1	7	397.1	6	426.9	6	87.4	6	93.0	5
9.	Kent (NC)	22.2	4	22.0	3	438.7	4	416.0	8	96.5	5	91.0	8
10.	OS 6 (NC)	36.1	1	23.0	2	361.0	7	397.4	9	72.2	8	84.5	10
	Mean	23.3		20.0		426.0		425.0		91.5		92.1	
	C. D. (P=0.05)	3.4				74.6				15.7			
	C.V. (%)	8.6				10.3				10.2			

TABLE 2

Comparative performance of dual type oat genotypes for fodder and seed yield during **rabi** 2011-12

S. No.	Genotypes	GFY (q/ha)				DMY (q/ha)				Seed yield (q/ha)			
		Hisar	R	All India*	R	Hisar	R	All India	R	Hisar	R	All India**	R
1.	RJB-1	155.5	3	244.9	8	18.7	4	41.1	11	40.7	1	23.5	2
2.	JHO 11-2	133.3	7	234.4	9	14.7	9	39.9	12	22.2	4	21.4	5
3.	JHO 11-3	114.8	10	226.6	11	20.7	3	42.2	10	14.8	7	24.3	1
4.	UPO 05-1	125.9	8	224.9	12	15.1	7	42.6	8	25.9	2	21.6	4
5.	JO 09-503	151.8	4	257.9	4	24.3	1	44.7	3	22.2	4	21.1	6
6.	OL 1696	133.3	7	224.5	13	10.7	13	39.7	13	18.5	6	17.7	11
7.	OS 335	122.2	9	253.0	6	12.2	10	42.3	9	18.5	6	18.5	9
8.	PLP 14	137.0	6	258.5	3	11.0	12	44.0	4	18.5	6	18.0	10
9.	SKO 176	148.1	5	232.1	10	16.3	6	43.6	6	9.6	8	9.6	12
10.	Kent (NC)	196.3	1	260.9	2	21.6	2	45.1	2	24.1	3	21.6	4
11.	OS 6 (NC)	174.1	2	256.6	5	17.4	5	43.9	5	25.9	2	19.8	7
12.	UPO 212 (NC)	100.0	11	267.2	1	15.0	8	45.3	1	25.9	2	19.4	8
13.	JHO 822 (NC)	151.8	4	251.0	7	12.1	11	42.9	7	20.4	5	23.0	3
	Mean	141.9		245.6		15.6		43.9		22.1		19.7	
	C. D. (P=0.05)	25.9				3.1				4.0			
	C.V. (%)	10.8				11.6				10.6			

*Mean of 20 locations, ** Mean of 16 locations, NC–National check.

Experiment 3

Here, the comparison of mean seed yield obtained from five trials conducted for assessing seed production potential at nine diverse locations across the country over five years from 2007-08 to 2011-12 (crop seasons) was made with the average seed yield obtained at All India level (Table 3).

TABLE 3
Seed production potential of oat genotypes at various locations across the country during 2007-08 to 2011-12

Locations/Seasons	Seed yield (q/ha)					Average
	2011-12	2010-11	2009-10	2008-09	2007-08	
Palampur	13.5	24.5	19.7	20.5	20.2	19.7
Srinagar	27.5	29.4	30.5	36.6	17.6	28.3
Hisar	23.5	24.6	31.6	23.9	40.3	28.8
Pantnagar	17.3	13.5	12.1	17.9	23.6	16.9
Ranchi	20.9	26.7	25.0	27.8	42.9	28.7
Jorhat	16.3	17.0	13.1	13.4	12.2	14.4
Jhansi	18.2	13.5	16.8	34.5	39.0	24.4
Jabalpur	28.8	23.6	25.9	24.2	27.1	25.9
Mandya	16.8	12.4	4.6	7.9	12.7	10.9
All India	20.3	20.6	19.9	23.0	26.2	22.0

The data for green fodder yield, dry matter yield and seed yield obtained from different trials/experiments were statistically analyzed and the results are presented in Tables 1, 2 and 3, respectively.

RESULTS AND DISCUSSION

Experiment 1

(a) Fodder yield : Genotypes JHO 2009-1 (597.0 q/ha), OS 363 (472.0 q/ha) and JHO 2009-2 and UPO 09-1 (444.3 q/ha) ranked first, second and third, respectively, for green fodder yield at Hisar, whereas genotypes JHO 2009-1 (452.7 q/ha), UPO 09-1 (449.3 q/ha) and JHO 2009-2 (441.6 q/ha) ranked first, second and third, respectively, at All India level. However, for dry matter yield, genotypes JHO 2009-1 (119.4 q/ha), OS 363 (113.3 q/ha) and JHO 2009-2 (106.6 q/ha) ranked first, second and third, respectively, at Hisar, whereas at All India level, the genotypes UPO 09-1 (98.6 q/ha), JHO 2009-2 (95.9 q/ha) and OS 363 (94.2 q/ha) stood first, second and third, respectively. This revealed that more or less the same genotypes held the rankings at Hisar as well as at All India level (Table 1). The mean GFY for the trial at Hisar was 426.0 q/ha which is almost at par with the average GFY at All India level (425.0 q/ha). Similarly, average DMY at Hisar was 91.5 q/ha almost at par with average DMY at All India level (92.1 q/ha).

(b) Seed yield : Genotypes OS 6 (36.1 q/ha), OS 363 (33.3 q/ha) and JHO 2009-1, UPO 09-1 & UPO 09-2 (27.8 q/ha) ranked first, second and third, respectively for seed yield at Hisar, whereas at All India level, the genotypes UPO 09-1 (23.7 q/ha) and OS 6 (23.0 q/ha) stood first and second, respectively. This revealed that more or less the same genotypes held the rankings at Hisar as well as at All India level (Table 1). The average seed yield for the trial at Hisar was 23.3 q/ha which was little higher than the average seed yield at All India level (20.0 q/ha).

Experiment 2

(a) Fodder yield : Results of the green fodder harvest taken 55-60 days after sowing of the trial revealed that the national checks Kent (196.3 q/ha) and OS 6 (174.06 q/ha) and genotype RJB-1 (155.5 q/ha) ranked first, second and third, respectively, for green fodder yield at Hisar showing thereby that none of the genotypes was better than both the national checks, whereas the national checks UPO 212 (267.2 q/ha) and Kent (260.9 q/ha) and genotype PLP 14 (258.5 q/ha) ranked first, second and third, respectively, at All India level, revealing thereby that none of the genotypes was better than the national checks at All India level. However, for dry matter yield, genotypes JO 09-503 (24.3 q/ha), national check Kent (21.6 q/ha) and JHO 11-3 (20.7 q/ha) ranked first, second and third, respectively, at Hisar, whereas at All

India level, the national checks UPO 212 (45.3 q/ha) and Kent (45.1 q/ha) and genotype JO 09-503 (44.7 q/ha) ranked first, second and third, respectively. This revealed that more or less the same genotypes held the rankings at Hisar as well as at All India level (Table 1). The mean GFY for the trial at Hisar was 141.9 q/ha which was quite low as compared to the average GFY at All India level (245.6 q/ha). Similarly, average DMY at Hisar was 15.6 q/ha which was quite low as compared to the average DMY at All India level (43.9 q/ha) (Table 2).

(b) Seed yield : After the fodder harvest, the crop was left for seed production. Genotypes RJB-1 (40.7 q/ha), UPO 05-1 (25.9 q/ha), national checks UPO 212 & OS 6 (25.9 q/ha) and Kent (24.1 q/ha) ranked first, second and third, respectively, for seed yield at Hisar, whereas genotypes JHO 11-3 (24.3 q/ha), RJB-1 (23.5 q/ha) and national check JHO 822 (23.0 q/ha) ranked first, second and third, respectively, at All India level. The average seed yield for the trial at Hisar was 22.1 q/ha which was little higher than the average seed yield at All India level (19.7 q/ha) (Table 2).

Experiment 3

Seed yield : Seed yield, averaged over five seasons (2007-08 to 2011-12) at nine different locations across the country presented in Table 3, showed that highest seed yield in oats was obtained at Hisar in Haryana, N-W Zone (28.8 q/ha), at Kanke, Ranchi in Jharkhand, N-E Zone (28.7 q/ha) and at Srinagar in J & K, Hill Zone (28.3 q/ha), followed by Jabalpur in Madhya Pradesh and Jhansi in Uttar Pradesh, Central Zone (24.4 q/ha) as compared to national average of 22.0 q/ha, emphasizing thereby that the climatic conditions of these locations are highly suited for achieving higher seed production in oats. The seed industries venturing in oat seed production business may benefit from these results. The season of 2007-08 was most productive (26.2 q/ha) followed by 2008-09 (23.0 q/ha), however, almost similar yield levels (approx. 20.0 q/ha) were realized during 2009-10 to 2011-12 (Anonymous 2007-08 to 2011-12).

As far as seed production is concerned, it is evident from all the above experiments and their results that seed production from the crop after taking one cut of green fodder is almost comparable with the seed production from a crop where no cut of green fodder was taken. So, there is benefit of getting one cut of green fodder 55-60 DAS and then taking seed production from the same crop left for seed production. Therefore, emphasis should be given to breed for dual type of oats to get high fodder yield at fodder harvest and then taking seed from the regenerated crop. This would help in saving the cost of cultivation also.

REFERENCES

American Food and Drug Association, 1996 : Food labelling : Health claims; oats and coronary heart disease. Federal Register : January 23, 1997, **62** : 3583-3601.

Anonymous, 2007-08 : Annual Report of AICRP (FC), Part-II : **Rabi** 2007-08. Published by Project Coordinating Unit, IGFRI, Jhansi.

Anonymous, 2008-09 : Annual Report of AICRP (FC), Part-II : **Rabi** 2008-09. Published by Project Coordinating Unit, IGFRI, Jhansi.

Anonymous, 2009-10 : Annual Report of AICRP (FC), Part-II : **Rabi** 2009-10. Published by Project Coordinating Unit, IGFRI, Jhansi.

Anonymous, 2010-11 : Annual Report of AICRP (FC), Part-II : **Rabi** 2010-11. Published by Project Coordinating Unit, IGFRI, Jhansi.

Anonymous, 2011-12 : Annual Report of AICRP (FC), Part-II : **Rabi** 2011-12. Published by Project Coordinating Unit, IGFRI, Jhansi.

Mehra, K. L. 1978 : *Technical Bulletin.* ICAR, New Delhi.

Peterson, D. M. 2001 : Oat antioxidants. *J. Cereal Sci.*, **33** : 115-129.

Sharma, S. K., S. R. Bhunia, and D. K. Yadava, 2001 : Response of oat (*Avena sativa* L.) to cutting management, method of sowing and nitrogen. *Forage Res.*, **27** : 167-170.

Welch, R. W., J. C. W. Brown, and J. M. Leggett, 2000 : Interspecific and intraspecific variation in grain and groat characteristics of wild oat (*Avena*) species : Very groat (1-3, (1-4)-β glucan in an *Avena atlantica* genotype. *J. Cereal Sci.*, **31** : 273-279.