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Shikha
KVK, Ranichauri, VCSG, UUHF, Tehri Garhwal, Uttarakhand, India

S Singh
Department of Soil Science, College of Agriculture, GB. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Correspondence
Shikha
KVK, Ranichauri, VCSG, UUHF, Tehri Garhwal, Uttarakhand, India

Varietal evaluation of oats (A*vena sativa* L.) varieties under different nutrient management

Shikha and S Singh

Abstract
A field experiment was conducted to assess the varietal evaluation of Oats (*Avena sativa* L.) varieties under different nutrient management, during Rabi 2014-15. The experiment was carried out with three treatments consisting of three fertility levels (Low, medium and high) and three varieties (Kent, UPO 94 and UPO 212) and three nutrient management approaches (GRD, STCR and STCR with INM). The data were statistically analyzed for evaluation of the green forage and dry matter yield of oats. The Green forage yields and dry matter yield was significantly higher in UPO 94 followed by UPO 212 and kent. Therefore, Variety UPO-94 performed better at medium and high fertility level under STCR nutrient management approaches.

Keywords: fertility levels, oats varieties, STCR, INM

Introduction
Agriculture is a key component for the production of foods. For this there is a need of inputs like seeds, fertilizers and other farm equipments without which the grower can not start growing crops but the main problem is the cost of these inputs and low production. Hence it is necessary to increase the production by minimizing the cost of production but also to analyze the possible factors causing low production and also to increase the income of the farmers by low cost of production. This can not fulfill only by agriculture but also they have to go for livestock production. So one of the component which is useful for increase the income of the farmers is livestock which is the integral component of agriculture and its contribution to national economy through milk, meat, wool as well as farm yard manure is enormous. However, the low productivity of our livestock is mainly due to poor availability of feed resources. So there is a need to provide a good quality of feed for the livestock so that they can give a good quality of milk, meat and manure etc. Amongst several fodder crops, oat proved to be the most successful and suitable fodder crop (Dubey *et al.,* 2013) [3] with the availability of high yielding early, medium and late maturing varieties. India has nearly 4.9% of the total cropped area under cultivated forages. It occupied about 80% of total world acreage. Oats (*Avena sativa* L.) is mainly grown as a forage crop but occasionally grown as grain crop. Oats ranks sixth in world cereal production. The area under Oats in India is about 1 lakh ha. In order to meet the fodder shortage for the growing animal population, the fodder growing area should ideally be around 12.0 million ha. However, diversion of area from food or commercial crops to forage crops would not be possible due to increasing population pressure (Hazra and Tripathi, 1998) [5].

Now the main concern is that the fertilizer management which is may vary with varieties of the crop and region as well as fertility status of field. Efficient fertilizer management through soil testing is important for achieving the production potential of crops. General recommendations have the limitation in that they do not consider the large scale variation in field to field fertility levels. Soil test based nutrient management approach of Ramamurthy *et. al.,* (1967) pronounced balance of soil & applied nutrient for efficient fertilizer use. Integrated nutrient management with different organic sources of nutrient found to be effective to improve quality character of oats. Organic manures have all the essential elements but their content is too low to satisfy the need of the fast growing and high yielding varieties of crops. Since plant derives nutrients from both soil and fertilizer, it is necessary to soil test based recommendation for economic and judicious use. Proper fertilization management in oats increases the herbage yield per unit time along with improvement in quality parameters to take care of two biological systems 'soil-plant' and 'plant-animals' (Suhrawardy and Kalita, 2001) [12].

The application of 100 percent recommended NPK(80-60-30 kg ha^{-1}) resulted in more plant height, green and dry forage yields of oat than 75 percent recommended dose of NPK (Kumar and Ramawat, 2006) [9]. Application of FYM is known not only to meet the nutrient requirement of the crop but also to improve the physical properties of soil such as soil structure and moisture holding capacity (Venkateswarlu, 2000) [17]. Every crop variety differs in its performance under different fertility levels and nutrient management options. Therefore, it is necessary to selecting the suitable varieties under suitable nutrient management & climatic conditions.

Materials and Methods

A field experiment was conducted to study the varietal evaluation of Oats (*Avena sativa* L.) varieties under different nutrient management during Rabi 2014-15 in a Aquic Hapludoll at D_7 block of Norman E. Borlogue Crop Research Centre of the G.B. Pant University of Agriculture and Technology, Pantnagar (29^0 N latitude and $79^029'$ E longitude). The experiment was conducted in two phases, i.e. creation of soil fertility levels by applying graded doses of N, P_2O_5 and K_2O (0,0,0; 100,100,100 and 200,200,200) and growing exhaust crop in the preceding crop season (Kharif, 2014) with growing of Sorghum (Pant chari-5). The soil was sandy loam with pH 7.3, having 0.67 per cent organic C, 170 kg ha^{-1} available N, 28 kg ha^{-1} available P and 184 kg ha^{-1} available K. In the second phase (Rabi 2014-15), each strip size of 60 m × 22.5 m size (made in the fertility gradient stabilizing experiment in the previous season) was divided into thirty plots (27 treatments + 3 control) resulting in total ninety (30×3) plots. Among these each plot was in the size of 3× 3 m, the total of 9 m^2 in size. The main experiment was conducted in split-split plot design, taking three fertility levels i.e. (F_1) low (0,0,0), (F_2) medium (100,100,100) and (F_3) high (200,200,200) in main plot, three variety of oats i.e. Kent (V_1), UPO 94(V_2) and UPO 212 (V_3) in sub plot and three methods of nutrient management, i.e. General Recommendations dose (GRD) (M_1), Soil Test Crop Response (STCR) (M_2) and STCR with Integrated Nutrient Management (INM) (M_3) in sub-sub plot.

Soil samples at 0-15 cm depth were collected from each plot before sowing of test crop and analyzed for soil texture, pH, EC, organic carbon, available nitrogen, phosphorus and potassium both in pre and post-harvest soil sample as per the standard procedure. At the time of harvesting the plant samples were taken from each plot .The plant samples were first air dried and then oven dry at 60˚C to a constant weight. The dried samples were ground in 'Weiley' type mill and stored in moisture proof plastic bags and finely collect in paper bag and numbering was done in each bag and analyzed for total nitrogen, phosphorus and potassium (Jackson, 1973) [6]. Other observations were also recorded *viz.*, green forage yield, dry matter yield, nutrient uptake, nutrient requirement.

Result and Discussion

1. Green forage yield under different nutrient management

Table 1 indicated that green forage yield of UPO 94 was found maximum under all the nutrient management GRD, STCR and STCR with INM i.e.405.75, 488.14 and 496.93 q ha^{-1} respectively. So among all treatment combinations, the maximum green forage yield was recorded in UPO 94 under STCR with INM i.e., 496.93 q ha^{-1}. The green forage yield obtained by this trend was also reported by Sheoran *et al.* (2005). Similar results in oats were also reported by Sharma and Verma, (2005). The highest fertility level recorded significantly higher total green fodder yield, Jehangir *et al.* (2013). Joshi (1980) reported superiority of UPO 94 over all other varieties at final harvesting because of more dry matter accumulation through leaves, shoots and whole plant. The abundant supply of nutrient (nitrogen) may have increased protoplasmic constituents and accelerated the process of cell division and elongation which might have resulted in luxuriant vegetative growth and thereby, higher biomass and dry matter yield Kumari *et al.* (2014).

Table 1: Effect of nutrient management on green forage yield of oats

Treatment Green forage yield (q ha^{-1})			
Variety	**M_1**	**M_2**	**M_3**
V_1	368.72	427.35	390.32
V_2	405.75	488.14	496.93
V_3	399.58	484.12	411.92
1. For comparing two varieties at same or different management		S.Em±15.26	C.D.at 5% 45.22
2. For comparing two management at same or different varieties		13.89	39.85

2. Dry Matter yield under different nutrient management

Table 2 indicated that the dry matter yield of UPO 94 and UPO 212 both perform better under GRD than kent variety but dry matter yield of kent variety significantly higher under STCR and STCR with INM nutrient management than GRD. Among all treatment combinations, the maximum dry matter yield was recorded in UPO 94 under GRD i.e.170.29 q ha^{-1}. In the interaction of variety and management, UPO 94 perform better and gave maximum dry matter yield under GRD. Such trend was also reported by Kumar and Ramawat, (2006) [9]. The dry matter yield of oats was significantly influenced by different varieties and nutrient management approaches.

Table 2: Effect of nutrient management on dry matter yield of oats

Treatments	**Dry matter yield (q ha^{-1})**		
Variety	**M_1**	**M_2**	**M_3**
V_1	119.47	155.94	142.89
V_2	170.29	162.42	158.84
V_3	156.19	151.53	149.34
1. For comparing two varieties at same or different management		S.Em± 8.82	C.D.at 1% 30.97
2. For comparing two management at same or different varieties		7.43	21.33

3. Effect of nutrient management on nutrient uptake

The data presented in the table 3 shows that nitrogen, phosphorus and potassium uptake was observed maximum in variety UPO 94 which was significantly superior over UPO 212 and kent. It was also observed that nitrogen, phosphorus and potassium uptake was significantly superior in STCR approaches of nutrient management over other management practices. Dobariya (1985) reported that the increase the phosphorus level increased the nitrogen uptake by seed and fodder. Higher available nitrogen under this level also resulted in higher N uptake. Increase in levels of phosphorus, the phosphorus content in plant as well as total uptake of P increased linearly (Ardeshna *et al.* 1993). Increase in both dry matter and K content consequently resulted in increased potassium uptake (Grewal and Malik, 2010) [4].

Table 3: Effect of nutrient management on nutrient uptake of oats

Treatments	Nutrient uptake (kg ha^{-1})		
Variety	**N**	**P**	**K**
Q	312.18	24.00	268.90
V_2	442.25	38.91	380.30
V_3	375.46	26.86	301.57
S. EM±	15.38	1.00	16.58
C.D. (1%)	47.38	3.08	51.10
Management			
M_1	368.52	29.09	306.36
M_2	386.62	31.96	329.22
M_3	374.76	28.72	315.20
S.Em±	12.19	0.95	10.34
C.D. (5%)	NS	2.72	NS

4. Effect of nutrient management on nutrient requirements

Table 4 indicated that fertility levels do not significantly differs nitrogen, phosphorus and potassium requirement for production of one quintal green forage yield. In medium fertility level the nitrogen requirement is increased by 16.04 and 6.81 % than low and high fertility levels, respectively. Nitrogen requirement of UPO-94 had increased by 18.75 and 9.19 % than Kent and UPO 212, respectively. Nitrogen and potassium requirements were significantly higher in UPO 94 than kent and UPO 212 under STCR than GRD nutrient management approaches. However Phosphorus requirement was maximum under general recommendations dose. High response of nutrients in this short duration crop was attributed to high nutrient flux i.e. amount per unit time per unit root surface (Sachan *et al.* 1993) [14]. This might be due to limited root surface developed by short duration crop thereby necessitating high rates of absorption of nutrient during peak growth period even though the total amount absorbed may not be very high.

Table 4: Effect of soil fertility, varieties and nutrient management on nutrient requirement of oats

Treatments	Nutrient requirement (kg q^{-1})		
Variety	**N**	**P**	**K**
V_1	0.80	0.062	0.74
V_2	0.95	0.085	0.87
V_3	0.87	0.063	0.78
S.Em±	0.029	0.0027	0.024
C.D. (5%)	NS	0.0083	0.074
Management			
M_1	0.83	0.075	0.74
M_2	0.93	0.068	0.85
M_3	0.86	0.066	0.80
S.Em±	0.031	0.0022	0.018
C.D. (5%)	0.090	0.0065	0.052

Conclusion

Green forage yield, dry matter yield, nutrient uptake and nutrient requirement were highest in UPO 94 among the kent and UPO 212 variety of oats in highest fertility level with STCR and STCR with INM approaches of nutrient management. So it was concluded that recommendation of fertilizer according to crop demand favours the high crop yield, nutrient uptake and nutrient requirement and hence the variety UPO 94 perform better under high fertility levels and STCR approaches of nutrient management than general recommendation dose. Therefore, screening of variety for different fertility levels is essential to get maximum production and sustaining crop yield, quality and soil health for the future.

References

1. Ardeshna RB, Modhwadia MM, Khanpora VD, Patel JC. Response of green gram (*Phaseolus radiatus*) to nitrogen, phosphorus and *Rhizobium* inoculation. Indian Journal of Agronomy. 1993; 38(3):490- 492.
2. Dobariya DK, Patel JC, Malavia DD. Response of gram to irrigation scheduling based on IW/CPE ratio under varying levels of nitrogen and phosphorus. Indian Journal of Agronomy. 1985; 30(4):518-519.
3. Dubey A, Rathi GS, Sahu R. Effect of nitrogen levels on green fodder yield of oat (*Avena sativa*) varieties. Forage Research. 2013; 39(1):39-41.
4. Grewal KS, Malik RS. Production efficiency of maize and oat to potassium application in two texturally different soils. Forage Research. 2010; 35(4):187-189.
5. Hazra CR, Tripathi SB. Effects of secondary and micronutrients in yield and quality of forages. Fertilizer News. 1998; 43(12):77-89.
6. Jackson ML. Soil chemistry analysis Prentice Hall of India Pvt. Ltd., New Delhi, 1973, 183.
7. Jehangir IA, Khan H U, Faisul-ul-Rasool and Mahdi S S. Yield and quality of fodder oat (*Avena sativa* L.) as influenced by sowing dates, fertility levels and cutting management. Applied Biological Research. 2012; 14(2): 164-167.
8. Joshi YP. Physiological basis of forage yield in different varieties of oats (*Avena sativa* L.). Thesis, M. Sc. G.B. Pant University of Agriculture and technology, Pantnagar, 1980.
9. Kumar N and Ramawat N. Effect of NPK and sulphur

application on forage production of oat under rainfed conditions of North Western Himalaya. Forage Research. 2006; 32(1):1-3.
10. Kumari A, Kumar P, Ahmad E, Singh M, Kumar R, Yadav R K, Datt C. and Chinchmalatpure A et al. Fodder yield and quality of oats fodder (*Avena sativa* L.) as influenced by salinity of irrigation water and applied nitrogen levels. Indian Journal of Animal Nutrition 2014; 31 (3): 266-27.
11. Rawat A and Agrawal S B. Effect of soil enrichment in conjunction with bio-organics and chemical fertilizers on yield and quality of fodder oat. Forage Research 2010; 35(4): 190-192.
12. Suhrawardy J and Kalita U. Effect of cutting management and nitrogen fertilization on fodder yield of rainfed oat (*Avena sativa*). Forage Research. 2001; 27(3):185-188.
13. Sharma KC, Verma RS. To study the combined effect of three levels nitrogen and phosphorus on forage oat. Forage Research. 2005; 31:118-122.
14. Sachan R S, Ram N and Gupta R A. Calibration of soil test values with fertilizer doses for maximum and economic yields for Laha (*Brassica juncea*). Indian Journal of Agricultural Research. 1993; 27: 64-68.
15. Sheoran, R.S.; Rana, D.S. and Singh, K.P. Integrated Nutrient Management for Sustainable Fodder Yield of Oat under Semi-arid Conditions. Forage Res. 2005; 31(2):126-129.
16. Kumar, Sunil and Dhar, Shiva. Influence of organic and inorganic sources of nutrients on forage productivity and economics of oat (*Avena sativa* L). Ann. Agric. Res. 2006; 27(3):205-209.
17. Venkateswarlu B. Land configuration and fertilizer management for sustainable groundnut production. Ph.D. Thesis submitted to Gujarat Agriculture University. Sardar Krishi Nagar, Gujarat, 2000.