RESEARCH PAPER International Journal of Agricultural Sciences, Vol. 5 Issue 1, January to May, 2009 : 145-147

Integrated nutrient management for seed production of oat (*Avena sativa* L.) under temperate conditions of Kashmir

B.A. KHANDAY*, A.R. SAMOON, WASEEM RAJA, JHANGIR KHANDAY AND F.A. BAHAR
Division of Agronomy, Sher-E-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, SRINAGAR (J&K) INDIA

ABSTRACT

A field experiment was conducted during *rabi* season of 2003-04 and 2004-05 at Shalimar Campus of Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar to study the effect of three levels of FYM (10, 15, 20 t ha^{-1}), three levels of phosphorus (20, 40, and 60 kg ha^{-1}) and two levels of zinc (No zinc, 10 kg Zn ha^{-1}) on seed production of oat (*Avena sativa* L.), laid out in randomised block design with three replications. The observations revealed that seed and straw yields of oat increased significantly upto 15 t ha^{-1} of FYM application. Increase in phosphorus upto 40 kg P_2O_5 ha^{-1} recorded significantly higher seed and straw yields. Significantly higher yield was also recorded with zinc @ 10 kg ha^{-1}. Yield attributes *viz.*, panicle length, grains panicle^{-1}, 1000-grain weight also improved significantly with the application of FYM, phosphorus and zinc upto 15 t ha^{-1}, 40 kg P_2O_5 ha^{-1} and 10 kg Zn, respectively.

Key words : Oats, Seed, Temperate, INM.

INTRODUCTION

In Kashmir province, the total area under fodder production is 28.22 thousand hectares, which is quite insufficient for the present livestock population of 2.27 million. However, one of the major constraint for extension of oat cultivation as a fodder in valley is the inadequate supplies of seed. Currently the seed requirement is met from other states through National Seed Corporation, but the cost is quite exorbitant. The cultivation of oat after paddy as a double cropping system has come up in a big way in recent past in valley. Both the crops being exhaustive and need high inputs of fertilizer. Judicious use of organic and inorganic sources of plant nutrition are to be evaluated under existing climatic conditions. Therefore, to increase the production of oat seed, the productivity need to be increased through integrated nutrients management.

MATERIALS AND METHODS

The present investigation was conducted at Shalimar Campus of Sher-e-Kashmir University of Agricultural Sciences and Technology-Kashmir, Srinagar during *rabi* 2003-04 and 2004-05. The experiment site is situated at 35^{o} 5´ N latitude and 74^{o} 8´ longitude E with altitude of 1587 m above mean sea level. The soil of field was silty clay loam in texture having pH (6.8), available nitrogen (267 kg ha^{-1}), phosphorus (14.5 kg ha^{-1}), potassium (160.0 kg ha^{-1}) and zinc (0.68 mg kg^{-1} of soil). The experiment comprising 18 treatment combinations *viz.*, 3 levels of FYM (10, 15 and 20 t ha^{-1} on fresh weight basis), 3-levels of phosphorus (20, 40 and 60 P_2O_5 kg ha^{-1}) and 2 levels of zinc (0 and 10 kg Zn ha^{-1}) was laid out in randomised block design with three replications. The variety 'Sabzar' was sown in rows spaced 20 cm apart using seed rate of 100 kg ha^{-1}. During both the years the crop was sown in last week of October and harvested at physiological maturity. Well decomposed FYM was mixed in soil in each plot one week before sowing of crop as per the treatments. Total quantity of phosphorus and zinc as per treatments and full quantity of potassium and 1/3rd of nitrogen was band placed just before sowing. The rest of nitrogen was top dressed in two equal splits at tillering and flowering stages.

RESULTS AND DISCUSSION

Effect of FYM:

The significant response was found upto 15 t FYM ha^{-1}, which registered the mean seed yield and straw yield superiority of 11.88 and 10.3 per cent over the mean seed yield and mean straw yield obtained by applying 10 t ha^{-1} FYM, respectively (Table 2). However, the application of 20 t ha^{-1} FYM do not increased seed yield and straw yield significantly than 10 t ha^{-1} FYM application. The increased seed yield and straw yield may be due to reflection of favourable effects of yield attributes (Table 1), besides the application of FYM also encourages the microbial population, improves the physical conditions of soil and hence the crop growth. All these benefits may have resulted in increased mean seed yield and straw

*** Author for correspondence.** Present Address : Division of Agricultural Engineering, Sher-E-Kashmir University of Agricultural Sciences and Technology (K), Shalimar, SRINAGAR (J&K) INDIA

Table 1: Yield attributes of oats influenced by FYM, phosphorus and zinc application

Treatments	Panicle length (cm)		Panicle/ m^2		Grains panicle^{-1}		Test weight (g)	
	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05
FYM levels (t/ha)								
10	18.80	16.50	331.50	320.46	44.10	37.80	36.70	35.10
15	19.50	17.20	335.90	325.70	47.20	40.50	36.50	39.30
20	20.10	18.25	338.60	326.25	47.61	42.30	35.01	39.20
S.E. ±	0.21	0.25	1.29	1.42	0.93	0.82	0.41	0.51
C.D. (P=0.05)	0.62	0.74	3.72	4.23	2.70	2.46	1.20	1.53
Phosphorus levels (kg/ha)								
20	18.90	17.25	330.90	321.50	44.10	42.30	35.00	35.60
40	19.61	18.42	33.51	326.40	47.31	45.50	37.20	37.20
60	20.00	19.30	337.20	326.70	47.50	45.70	36.00	37.50
S.E. ±	0.21	0.25	1.29	1.42	0.93	0.82	0.41	0.43
C.D. (P=0.05)	0.62	0.74	3.2	4.23	2.70	2.46	1.20	1.29
Zinc levels (kg/ha)								
0	19.40	18.00	332.50	330.60	45.10	43.20	35.60	35.30
10	19.60	18.30	335.70	331.75	49.61	47.60	36.60	36.35
S.E. ±	0.17	0.19	1.05	0.90	0.76	0.72	0.33	0.24
C.D. (P=0.05)	NS	NS	NS	NS	2.20	2.16	0.92	0.72

yield at higher levels of FYM. Such beneficial effects of FYM have also been demonstrated by Singh and Sachan (1995). Significant increase was recorded upto 15 t FYM ha^{-1} with respect to panicle length, panicles m^2, grains panicle^{-1} and test weight. These results are in conformity with Singh and Sachan (1995) and Jayanthi *et al*. (2002).

Effect of phosphorus:

The seed yield and straw yield increased significantly upto 40 kg P_2O_5 ha^{-1}. The magnitude of increase with application of 40 kg P_2O_5 ha^{-1} was 6.7 and 7.7 per cent in mean seed yield and mean straw yield, respectively than 10 kg P_2O_5 ha^{-1} application. However, an increase level of phosphorus from 40 kg P_2O_5 to 60 kg P_2O_5 ha^{-1} have not significantly increased the seed yield and straw yield of oat. The increase in seed yield and straw yield may be due better yield attributes achieved at high phosphorus level (Table 1). Similar findings were also reported by Roy and Pradhan (1992). An increase in the level of phosphorus from 20 kg P_2O_5 ha^{-1} to 60 kg P_2O_5 ha^{-1} brought a significant increase in panicle length, panicles m^{-2}, grains panicle^{-1} and test weight (Table 1). This may be because phosphorus acts as a structural component of cell constituents and play a vital role in energy transformation of various metabolic activities of plants. These results are similar to findings of Ticky (1992).

Effect of zinc:

There was significant increase in the mean seed yield and mean straw yield of 4.8 and 6.3 per cent with application of 10 kg Zn ha^{-1} than no application of zinc, respectively (Table 2). The application of 10 kg Zn ha^{-1} also resulted in the significant increase in the yield attributes such as grains panicle^{-1} and test weight. The increase in seed yield and straw yield may be due to better yield attributes with application of 10 kg Zn ha^{-1} (Table 1), besides zinc plays an important role in the auxin formation and in other enzyme systems. This can be ascribed to the beneficial effect on crop growth, which in turn may have increased grains panicle^{-1} and test weight. These results are similar to those of Gangwar and Gill (1991).

Economics:

The net returns of Rs. 33840.0 were obtained with 15 t FYM ha^{-1}, which was more than 10 t FYM ha^{-1} (Rs. 30792.5) and 20 t FYM ha^{-1} (Rs. 32112.7) (Table 2). Application of 60 kg P_2O_5 ha^{-1} (Rs. 34127.7) obtained marginal difference in net returns than 40 kg P_2O_5 ha^{-1} (Rs. 34015.7) application. The net returns under 10 kg Zn ha^{-1} (Rs. 34457.5) was more than no application zinc (Rs. 32589.5). The above results are due to the higher seed yield and straw yield produced under the respective higher net returns obtained levels (Table 2).

Conclusion:

Results showed that application of 20 t FYM ha^{-1} and 60 kg P_2O_5 ha^{-1} have marginal effect on seed yield

Table 2: Influence of FYM, phosphorus and zinc application on grain yield, straw yield and economics of oat

Treatments	Grain yield (q ha^{-1})		Mean	Straw yield (q ha^{-1})		Mean	Cost of cultivation (Rs)	Gross returns(Rs.)		Mean	Net returns (Rs)		Mean
	2003-04	2004-05		2003-04	2004-05			2003-04	2004-05		2003-04	2004-05	
FYM levels (t/ha)													
10	51.20	45.20	48.20	96.70	84.60	90.65	12300.0	45795.0	40390.0	43092.5	33495.2	28090.0	30792.5
15	57.10	50.75	53.93	109.50	90.50	100.00	14300.0	51155.0	45125.0	48140.0	36855.0	30825.0	33840.0
20	56.20	52.35	54.28	109.61	91.70	100.66	16300.0	50440.0	46385.0	48412.7	34140.5	30085.0	32112.7
S.E.±	0.93	0.83	-	0.62	0.56	-							
C.D. (P=0.05)	2.68	2.48	-	1.79	1.68	-							
Phosphorus levels (kg/ha)													
20	52.20	45.70	48.95	98.40	85.20	91.80	12300.0	46680.0	40820.0	43750.0	34380.0	28250.0	31450.0
40	55.80	48.65	52.23	107.50	90.35	98.93	12718.0	500.15.0	43452.5	46733.7	37297.0	30734.5	34015.7
60	56.40	49.20	52.80	109.90	91.05	100.48	13136.0	50615.0	43912.5	47263.7	37479.0	30776.5	34127.7
S.E.±	0.93	0.83	-	0.62	0.56	-							
C.D. (P=0.05)	2.68	2.48	-	1.79	1.68	-							
Zinc levels (kg/ha)													
0	53.90	46.53	50.22	102.50	0.48	94.35	12300.0	48245.0	41534.0	44889.5	35945.0	29234.0	32589.5
10	56.10	49.25	52.68	108.00	2.70	100.35	12700.0	50280.0	44035.0	47157.5	37580.0	31335.0	34457.5
S.E.±	0.76	0.72	-	0.50	0.48	-							
C.D. (P=0.05)	2.19	2.16	-	1.46	1.35	-							

Cost of seed = Rs. 12 / kg; Cost of MOP = Rs. 550/q; Cost of straw = Rs. 50/q; Cost of zinc = Rs. 4000/q; Cost of FYM = Rs. 400/t
Cost of labour Rs. 60/labour/day; Cost of urea = Rs. 550 / q; Cost of seed bed preparation = Rs. 2000/ha.; Cost of DAP = Rs.1050 /q

and straw yield, than 15 t FYM ha^{-1} and 40 kg P_2O_5 ha^{-1}. However, the application of 15 t FYM ha^{-1} and 40 kg ha^{-1} were economically feasible. Application of 10 kg Zn ha^{-1} was better both with respect to productivity and economically than no zinc application. Hence, the application of 15 t FYM ha^{-1} along with 40 kg P_2O_5 ha^{-1} and 10 kg Zn ha^{-1} can be recommended for oat production under temperate condition of Kashmir.

REFERENCES

Gangwar, K.S. and Gill, A.S. (1991). Effect of chelated zinc on the forage yield and quality of perennial gross under irrigated conditions. *Forage Res*., **17**(1) : 79-81.

Jayanthi, C., Malarvizhi, P., Fazullah, Khan, A.K. and Chinnusamy, C. (2002). Integrated nutrient management in forage oat (*Avena sativa* L.). *Indian J. Agron.*, **47**(1) : 130-133.

Roy, S.K. and Pradhan, A.C. (1992). Forage and grain yield of oat (*Avena sativa* L.) as influenced by phosphorus levels and cutting management in soils of West Bengal. *Indian J. Agron.*, **37**(4) : 823-825.

Singh, S. and Sachan, R.S. (1995). Nitrogen, phosphors and potassium requirement for targeted production of forage oats (*Avena sativa* L.) in soil. *J. Potassium Res.*, **11**(2) : 193-197.

Ticky (1992). Regulation yield forming factors in oat by Agro-ecological factors. *Rostinna Vyros*, **38** (8) : 633.

Received : November, 2007; Accepted : November, 2008