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Effect of Integrated nutrient management on yield and quality of oat crop (*Avena sativa* L,.)

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ABSTRACT

A field experiment was conducted at R.B.S. College Research farm Bichpuri, Agra (U.P.) to study the effect of integrated nutrient management on yield and quality of oat. Ten treatments were evaluated in randomized block design with three replications. The integrated use of inorganic fertilizer along with organic sources had positive and significant effect on green foliage and dry matter yield of oat crop. The higher yield of oat fodder could be achieved by adopting integrated nutrient management (75% NPK + FYM @10 tonnes ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) Application of 75%NPK + FYM @10 tonnes ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1} proved significantly superior to other treatments in respect of crude fiber, crude protein, reducing and non reducing sugar content. The minimum value of these parameters was recorded under control.

Key words: INM, quality, yield, oat

INTRODUCTION

In India oat is chiefly grown as rabi fodder crop and provide fodder especially suited to horse and milch animals of all kinds. Oat forage can be fed either green or silage. It is high in protein, fat vitamin B-1, and minerals as phosphorus and Iron. Management of nutrients is important aspect of the Indian soil. The application of FYM in the soils helps in increasing the fertility status of the soil as well as physical condition, including its water holding capacity. Recent researches indicate that a judicious combination of organic manures and fertilizer can better increase the production of fodder crops. Therefore, use of both organic manure and chemical fertilizer in appropriate proportion assume special significance as complementary and supplementary to each other in crop production. Proper and optimum application of fertilizers not only increases the yield but also favorably affects the quality of the produce. To curb this trend of declining yield, there is need to adopt the concept of integrated nutrient management. Organic manure is important components of an integrated nutrient management and may help to recover soil health. Besides, organic manures also supply the traces of micronutrients, which are not supplied by chemical fertilizers. Integrated system approach is not only a reliable way of obtaining high productivity with substantial fertilizer economy, but also a concept of ecological soundness leading to sustainable agriculture. The basic concept of integrated plant nutrient system is maintenance and improvement of soil fertility for sustaining crop productivity on long-term basis. Application of different organic-inorganic sources was found very effective in realizing high yield, better economy and improved residual fertility of the soil. Zinc one of the essential micronutrients is involved in plants process such as oxidation of carbohydrates to carbon dioxide and water. It activates the enzyme, which are directly involved in the synthesis of chlorophyll. The deficiency of Zn under semi-arid climate has emerged as a serious limitation to crop production. Zn deficiency is being widely expressed in the light textured soils. Therefore the present study was undertaken to assess the effect of integrated nutrient management on yield and quality of oat.

METHODS AND MATERIALS

The field experiment was conducted at Agriculture research farm of R.B.S College Bichpuri Agra. The field experiment was carried out with ten treatments of organic source and inorganic fertilizer as T_1N_0 P_0 K_0(control) , T_2 N_{120} P_{30} K_{30}(100% N.P.K), T_3N_{90} $P_{22.5}$ $K_{22.5}$(75% N.P.K), T_4 N_{60} P_{15} K_{15} (50% NPK) T_5 (75% NPK+ $ZnSO_4$ @ 25 kg ha^{-1}) T_6(75% NPK + FYM @ 10 tonnes ha^{-1}) T_7 (75% NPK + FYM @10 tonnes ha^{-1} + $ZnSO_4$ @ 25 kg ha^{-1}) T_8 (50%NPK+ $ZnSO_4$ @ 25 kg ha^{-1}) T_9 (50% NPK + FYM @ 10 tonnes ha^{-1}) T_{10} (50% NPK + FYM @10 tonnes ha^{-1}+ $ZnSO_4$ @ 25 kg ha^{-1}). These treatments were replicated three times following randomized block design. The soil had, pH 8.6, organic

carbon 4.4g kg^{-1}. Available NPK 195,10, 34kg ha^{-1} and 0.54 mg kg^{-1} Zn. The seed of oat was sown in each plot in the second week of October using 80kg seed ha^{-1}. Equal amount of water was supplied to every plot at the time of irrigation. At the harvest the green foliage and dry matter yields were recorded. The plant samples were analysed for their nitrogen content by kjeldahal method (Jackson 1973). Crude fiber, reducing and non- reducing sugar in plants were determined by adopting standard procedures (Chopra and kanwar 1976). The experimental data were subjected to statistical analysis using the procedure of "Analysis of variance". The difference between significant treatments mean were tested against critical differences at 5% level of significance

RESULTS AND DISCUSSION

Yield

Data (Table1) reveal that the maximum green foliage yield (580q ha^{-1}) of oat was recorded with T_7 (75%NPK+FYM@10 tonnes ha^{-1} + $ZnSO_4$@25kg ha^{-1}) in comparison to other INM treatments. It may be suggested that plants under this combination developed healthy roots and enabled plants to absorb more moisture and nutrients relatively from lower strata and also probably from higher tension by increasing with the depth of roots penetration/Proliferation in soil, which has in turn improved growth and green foliage yield. Similar findings were reported by Chandra and Ram (2007) and Pandey (2018).The dry matter yield of oat increased significantly with each INM treatment in comparison to control. The highest yield of dry matter was recorded with 75% NPK + FYM @10 t ha^{-1} + $ZnSO_4$@ 25 Kg ha^{-1}. Incorporation of organic source (FYM) with inorganic fertilizer proved more beneficial regarding dry matter accumulation. Application of FYM had additive effect on dry matter production. The use of zinc sulphate in presence of FYM exerted maximum positive effect on improvement of soil biological productivity. Similar findings were reported by Singh (2017).

Table 1: Effect of INM on yield of oat crop

Treatments	Green Foliage (q ha^{-1})	Dry matter (q ha^{-1})	Crude Fibre (%)
$T_1N_0\ P_0\ K_0$(control)	420	60.00	27.5
$T_2\ N_{120}\ P_{30}\ K_{30}$(100% NPK)	475	67.85	31.5
$T_3N_{90}\ P_{22.5}\ K_{22.5}$(75%NPK)	440	62.85	30.5
$T_4\ N_{60}\ P_{15}\ K_{15}$ (50%NPK)	425	60.71	29.5
T_5 (75%NPK+$ZnSO_4$@25kg ha^{-1})	475	67.85	28.5
T_6(75%NPK+FYM@10 t ha^{-1})	500	71.42	32.5
T_7 (75%NPK+FYM@10 t + $ZnSO_4$@25kg ha^{-1})	580	82.85	34.2
T_8 (50%NPK+ $ZnSO_4$@25kg ha^{-1})	430	61.42	30.0
T_9 (50%NPK+FYM@10 t ha^{-1})	475	67.85	28.0
T_{10} (50%NPK+FYM@10 t + $ZnSO_4$@25kg ha^{-1})	550	68.57	33.0

Quality

Various INM treatments showed significantly better results in term of crude fiber content over control. However most of the treatments were at par with respect to crude fiber content. It is seen from the data (Table2) that various INM treatments showed beneficial effect on crude protein content over the control. Treatment T_7 (75% NPK+ FYM @ 10 t ha^{-1} + $ZnSO_4$@25 Kg ha^{-1}) showed significantly better result in terms of crude protein content over rest of the treatments. Maximum crude protein content was recorded with T_7 treatment. The minimum value of protein content in oat plants was recorded in control. This may be due to poor nitrogen supply in control treatment. Similar results were reported by Singh (2017).

Treatment T_6 and T_7 showed significantly better performance over other treatments in respect of reducing sugar content in oat plants. Application of 75% NPK + FYM @ 10 t ha^{-1} + $ZnSO_4$ @ 25 Kg ha^{-1} maintained its superiority followed by T_{10} and T_2 treatments. It is evident from data (Table 2) that INM treatments showed significantly better response in terms of non-reducing sugar content over control. The highest concentration of non-reducing sugar

(4.20%) was recorded with T_7 (75% NPK+ FYM @ 10 t ha^{-1} + $ZnSO_4$@25 Kg ha^{-1}). Whereas minimum non-reducing sugar content was recorded with control.

Table 2: Effect of INM on quality of oat crop

Treatments	Crude Protein (%)	Reducing sugar (%)	Non reducing sugar (%)
$T_1 N_0 P_0 K_0$(control)	9.37	2.10	2.55
$T_2 N_{120} P_{30} K_{30}$(100% NPK)	10.68	3.00	3.60
$T_3 N_{90} P_{22.5} K_{22.5}$(75%NPK)	10.62	2.95	3.54
T_4 $N_{60} P_{15} K_{15}$ (50%NPK)	10.37	2.75	3.30
T_5 (75%NPK+$ZnSO_4$@25kg ha^{-1})	10.31	2.70	3.24
T_6(75%NPK+FYM@10 t ha^{-1})	10.81	3.15	3.78
T_7 (75%NPK+FYM@10 t+ $ZnSO_4$@25kg ha^{-1})	11.24	3.50	4.20
T_8 (50%NPK+ $ZnSO_4$@25kg ha^{-1})	10.56	2.90	3.48
T_9 (50%NPK+FYM@10 t ha^{-1})	10.31	2.50	3.00
T_{10} (50%NPK+FYM@10 t + $ZnSO_4$@25kg ha^{-1})	10.99	3.30	3.96

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