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Integrated Use of Organic and Inorganic Fertilizers in Oat for Improving Its Productivity

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Abstract:

Application of organic materials with inorganic fertilizer helps in proper nutrition of crop and also maintains soil fertility. An experiment was conducted at Livestock Research and Development Station Surezai, Peshawar 2011-12, to study the integrated effect of organic and inorganic fertilizers on the nutritive value and fodder yield of oat. The experiment was laid out in randomized complete block design with three replications. Experimental treatments were consisted of T1 (Control), T2 (100% inorganic), T3 (75% inorganic and 25 organic), T4 (50 % inorganic and 50% organic), T5 (25% inorganic and 75% organic) T6 (100% organic). Organic nitrogen was derived from farm yard manure and inorganic from urea. Various organic and inorganic ratios significantly affected oat yield and yield components of oat. Higher yield was observed with integrated application of organic and inorganic fertilizers in the ratios of 50 % inorganic and 50% organic. It is concluded that a ratio of 50 % inorganic and 50%

organic is recommended for higher nutritive value and fodder yield in oat.

Key words: Oat, organic fertilizers, and yield

Introduction

Oat (*Avena sativa* L.) is one of the most important food and feed crop grown in Pakistan. It can be grown in various soil types, moisture conditions and waterlogged conditions better than most other cereals (Alemayehu, 1997). Oat production is limited by various factors which mainly includes lack of proper nutrition. Organic sources like farm yard manure (FYM), poultry manure (PM), green manuring and compost etc not supply the organic matters but also increase the fertility status of soil (Chang *et al*., 1991). The integration of organic and inorganic sources of nutrients not only supply essential nutrients but also some positive interaction with chemical fertilizers to increase their efficiency and there by reducing environment hazards (Ahmad *et al*., 1996). For consistent cropping system combined use of FYM and inorganic fertilizers is helpful (The World Bank, 1999). Therefore, present study was designed to investigate the suitable levels of organic and inorganic sources of fertilizers for obtaining increased growth, forage yield and quality of oat.

The protein and fiber contents in the fodder and forages are not constant but assorted according to stage of cut and fertilizer application (Knettle *et al*., 1991). Meager digestibility and poorer intake are usually linked with high fiber content and low protein content. As the crops gets matures, dry matter and cell wall constituent raises and protein contents drop (Hunt *et al*., 1992).

One of several reasons for low yield of fodder oat is low fertility status of most cultivated soil, especially nitrogen is

deficient in the cultivated soils of the world (Ulysses, 1982). To improve the yield and quality of fodder crops is to determine their fertilizer requirements. The management of plant nutrition not only enhances the forage production but also improves the quality of forage (Khandaker and Islam, 1988). Nitrogen plays a very important role in raising the nutritive level of the fodders. Nitrogen is a major component of amino acids, the building blocks of proteins. Increasing in dose of nitrogen to plant enhance the protein level up to some extant but nitrogen application to crop beyond a certain limits can not benefice the crops (Don, 1989).

The aim of the present experiment was to study the effect of organic and inorganic fertilizer on the yield and yield components of oat. Also to know the weeds concentration in various organic and inorganic treatments.

Materials and methods

Experimental Location

The experiment was conducted at Livestock Research and Development Station Surezai Peshawar. The site is located at 34^0 N and 71.33^0 E at an altitude of 490 m above sea level in Khyber Pakhtunkhwa Pakistan. The experimental site has a warm to hot, subtropical continental climate with mean annual rainfall less than 350 mm.

Soil of the Experimental Site

The soil of the experimental site belongs to Tarnab series fine silty with mixed hyperthermic Udic Ustept of clay loam and pH ranges from 7.7-8. The soil is deficit in nitrogen and contains less than one percent organic matter.

Experimental Materials

Enhancing oat productivity through integrated use of organic and inorganic fertilizers was evaluated at Livestock Research &

Development Station Surezai Peshawar for Rabi 2011-12. Experimental treatments were consisted of T1 (Control), T2 (100% inorganic), T3 (75% inorganic and 25 organic), T4 (50 % inorganic and 50% organic), T5 (25% inorganic and 75% organic) T6 (100% organic). Organic nitrogen was derived from Farm Yard Manure and inorganic form urea. The experiment was conducted in randomize complete block design with three replications. Plot size was 1.8x4 m and Seed rate was 80 kg ha^{-1}. Irrigation was uniformly applied to each plot uniformly. Data was recorded on weeds density m^{-2} plant height, grains yield and biological yield.

Statistical Analysis

The data were statistically analyzed using analysis of variance appropriate for randomized complete block design. Combine analysis was performed to detect the variation between the years. Means were separated using LSD test at 0.05 level of probability (Steel and Torrie, 1984).

Results and discussions

Weeds density m^{-2}

Data regarding weeds density in oat as affected by various organic and inorganic ratios is presented in table 1. Statistical analysis of the data shows that weeds density of oat was significantly affected by various organic and inorganic ratios. Mean values shows that maximum weeds density (80 m^{-2}) was recorded in T6 (100 % organic) while minimum (48 m^{-2}) weeds density was recorded for T2 (100 % inorganic). More weed m^{-2} were recorded in organic fertilizers this is due to the fact that source for organic fertilizer was farm yard manure. As farm yard manure contains crop residues, weeds, animals manure etc which contains seed of weeds therefore more number of weeds were recorded in treatments to which 100 % organic fertilizers were applied. These results are in line with Reiad et

al. (1992) and Lakoo et al. (2004) who reported that organic manures and inorganic fertilizer increase number of weeds.

Plant height (cm)

Data regarding plant height of oat as affected by various organic and inorganic sources is presented in table 1. Statistical analysis of the data shows that plant height of oat was significantly affected by various organic and inorganic ratios. Mean values shows that maximum plant height (118.3 cm) was produced by T6 (100 % organic) while minimum (103 cm) plant height was recorded for T1 (Control). Organic fertilizers produced more plant height due to the fact that besides nitrogen they contain high concentration of P and other minerals nutrients. These findings are in line with the results of Zada *et al*. (2000), who reported that plant height increases with the increase in farmyard manure.

Biological yield (kg ha^{-1})

Data regarding biological yield of oat as affected by various organic and inorganic sources is presented in table 1. Statistical analysis of the data shows that biological yield of oat was significantly affected by various organic and inorganic ratios. Mean values shows that maximum biological yield (15972 kg ha^{-1}) was produced by T6 (100 % organic) followed (4386 kg ha^{-1}) by T4 (50 % inorganic and 50% organic) while minimum (10417 kg ha^{-1}) biological was produced by T3 (75% inorganic and 25 organic). Hossain et al. (2002) reported that combine use of organic and inorganic fertilizers increased wheat productivity compared with sole organic or inorganic fertilizer application.

Grain yield (kg ha^{-1})

Data regarding grain yield of oat as affected by various organic and inorganic sources is presented in table 1. Statistical analysis of the data shows that grain yield of oat was significantly affected by various organic and inorganic ratios.

Mean values shows that maximum grain yield (3110 kg ha^{-1}) was produced by T4 (50% inorganic and 50 organic) followed (4386 kg ha^{-1}) by T6 (100 % organic) while minimum (1588 kg ha^{-1}) was produced by T1 (control). Organic fertilizers in combination with inorganic fertilizers produced more grain yield, same results are obtained by Rehman & Khalil, (2008) and Hossain *et al*., (2002).

Harvest index (%)

Data regarding harvest index of oat as affected by various organic and inorganic sources is presented in table 1. Statistical analysis of the data shows that harvest index of oat was significantly affected by various organic and inorganic ratios. Mean values shows that maximum harvest index (25.3%) was recorded by T2 (100 % inorganic) while minimum (12.53%) grain was produced by T1 (control).

Conclusions

Our finding suggest that the application of a ratio of 50 % inorganic and 50 % organic fertilizers to the oat contributed greatly towards the growth and yield contributing attributes. Nevertheless, the application of inorganic fertilizers surpassed weeds population while organic fertilizers are more environmental friendly and reduce the risk of pollution then the inorganic ones. A combination of 50 % inorganic and 50 % organic fertilizers is recommended for high production and weeds management in oat.

Table 1: weeds density, plant height, biological yield, grain yield and harvest index of oat as affected by various organic and inorganic rations.

Treatments	Weeds Density m^{-2}	Plant height cm	Biological Yield kg ha^{-1}	Grain Yield kg ha^{-1}	Harvest Index (%)
T1 (Control)	55.67 b	103.6 c	12847 abc	1588.9 b	12.53 c
T2 (100% Inorganic)	48.00 b	116.4 a	10417 c	2553.5 a	25.30 a
T3 (75% inorganic and 25 organic)	50.67 b	109.1 abc	15139 ab	2415.3 a	16.53 bc
T4 (50 % inorganic and 50% organic)	64.34 ab	115.7 ab	15972 a	3111.0 a	19.57 abc
T5 (25% inorganic and 75% organic)	64.00 ab	105.8 bc	12222 bc	2550.0 a	21.33 ab
T6 (100% organic).	80.67 a	118.3 a	13194 abc	2562.5 a	19.70 abc
LSD (P<0.05)	19.92	10.279	3215.6	776.24	7.31

Mean followed by same letter(s) with in the same category are not different statistically using least significant difference (LSD) test at 5% level of probability.

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