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ENHANCING NUTRITIVE VALUE AND GREEN FODDER PRODUCTION OF FODDER OAT THROUGH INTEGRATED USE OF ORGANIC AND INORGANIC FERTILIZERS

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ABSTRACT

Livestock play an important role in the economy of Pakistan. The production of livestock is limited by insufficient fodder and poor nutrition. Integrated use of organic and inorganic fertilizer play a vital role in proper nutrition and increase green fodder production in fodder crops. In this regard 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 fodder yield and nutritive value of oat. Higher fodder 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.
Keywords: Oat, Organic fertilizers, Nutritive value, Fodder yield

INTRODUCTION

Fodder production in Pakistan is approximately 52-54 percent less than actual requirement (Bhatti, 1992). Fodder crops in agriculture needs lot of emphasis because for sustainable livestock production regular fodder availability is a basic requirement to produce milk, butter and other byproducts for human consumption in Pakistan milk production per animal is low because of unavailability of green fodders. Fodder production is limited because of low fertility of soil (Iqbal *et al.,* 2009).

Oat (*Avena sativa* L.) is one of the most important feed crops 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 supplied essential nutrients but also some positive interaction with chemical fertilizers to increase their efficiency and reduce environment hazards (Ahmad *et al.,* 1996). For consistent cropping 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.

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MATERIALS AND METHODS

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.

Enhancing fodder 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 was1.8x4 mand seed rate was 120 kg ha^{-1}. Irrigation was uniformly applied to each plot uniformly. Quality parameters like crude protein %, Ash % and N % were determined by using the methods recommended by (AOAC, 1990). All the plots in each replication were harvested and tied into bundles and these bundles were weighed separately with spring balance to determine the total biomass per plot and then yield was converted on hectare basis in tones.

Statistical Analysis

The data was 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 DISCUSSION

Tissue nitrogen content (%)

Data regarding % N in oat tissues as affected by various organic and inorganic ratios is presented in table 1. Statistical analysis of the data shows that % N in oat tissues was significantly affected by various organic and inorganic ratios. Mean values show that maximum N (1.66 %) was recorded for T2 (100 % organic) while minimum (1 %) N was recorded in T6 (100 % organic). More N % was recorded in inorganic fertilizers, this is due to the fact that inorganic fertilizers are quick in action and contribute more to % N in tissues. Similar results were reported by Silva *et al.,* (2006), Patidar & Mali (2001) and Rao & Shaktawat (2002).

% Ash

Statistical analysis of the data shows that % ash of oat was significantly affected by various organic and inorganic ratios (table 1). Mean values shows that maximum ash (10.73 %) was recorded for T2 (100% Inorganic) followed by (10.83 %) by T1 (Control) while minimum (6.83 %) ash was produced by T6 (100 % organic). More %ash was recorded in inorganic fertilizers this is due to the fact that sources for organic fertilizers reduce mineral ratios therefore % ash was decreased. These results are in agreements with Czesławaand Baran (2004).

% Crude Protein

Crude protein is one of the most important factor in animal nutrition. Data regarding % crude protein in oat as affected by various organic and inorganic ratios is presented in table 1. Statistical analysis of the data shows that % crude protein of oat was significantly affected by various organic and inorganic ratios. Mean values show that maximum crude protein (10.10 %) was recorded for T2 (100 % inorganic). While minimum (5.3 %) crude protein was produced by T6 (100 % organic). More % crude protein was recorded in inorganic fertilizers this is due to the fact that inorganic fertilizers contribute to more % crude protein in fodder crops. Same results were obtained by Tariq (1988).

Crop Growth Rate (g m^{-2} day^{-1})

Data regarding crop growth rate in oat as affected by various organic and inorganic ratios is presented in table 1. Statistical analysis of the data shows that crop growth rate of oat was significantly affected by various organic and inorganic ratios. Mean values show that maximum crop growth rate (75.33 g m^{-2} day^{-1}) was recorded for T4 (50 % organic and 50% organic). While minimum (37.6 g m^{-2} day^{-1}) crop growth rate was produced by T1 (control). More crop growth rate was recorded in inorganic fertilizers; this is due to the fact that sources for organic fertilizers were farm yard manure. These results indicate that combination of organic and inorganic fertilizers contribute to more increased crop growth rate of fodder oat. These results are in line with Kumar and Puri (2001) and Song *et al.,* (1998) reported that increasing level of N increased crop growth rate was recorded in a treatment which contains 100 organic fertilizers. N supply has substitution effect on plant growth and development because it is a fundamental constituent of leaf cell component, especially those associated with photosynthetic apparatus.

Green fodder (tons ha^{-1})

Data regarding green fodder of oat as affected by various organic and inorganic sources is

presented in table 1. Statistical analysis of the data shows that green fodder of oat was significantly affected by various organic and inorganic ratios. Mean values shows that maximum green fodder (74.67 tons ha^{-1}) was produced by T6 (100 % organic) followed (74.40 tons ha^{-1}) by T4 (50 % inorganic and 50% organic) while minimum (45.06 ton ha^{-1}) green fodder was produced by T1 (Control). Organic fertilizers produced more green fodder due to the fact that besides Nitrogen they contain high concentration of P and other minerals nutrients. Same results are obtained by Devi (2002) also reported that fodder maize variety "African Tall" produced significantly higher green fodder at higher dose of nitrogen while biofertilizers produced lower yield. Green fodder increased significantly up to 120 kg N ha-1. In contrast Reiad *et al.,* (1992) and Lakoo *et al.,* (2004) reported that organic manures and inorganic fertilizer increase the maize fodder yield.

Table 1: Tissue nitrogen (%), Ash (%), Crude protein (%), Crop growth rate and Fodder yield of oat as affected by various organic and inorganic ratios

Treatments	N (%)	Ash (%)	Crude Protein (%)	Crop Growth Rate (g m^{-2} day^{-1})	Fodder Yield (tons ha^{-1})
T1 (Control)	1.66 a	10.46 a	9.63 a	37.67 b	45.067 c
T2 (100% Inorganic)	1.63 a	10.73 a	10.10 a	68.37 a	52.00 bc
T3 (75% inorganic and 25% organic)	1.63 a	8.93 ab	9.10 a	73.20 a	62.57 abc
T4 (50 % inorganic and 50% organic)	1.50 ab	9.33 ab	8.07 a	75.53 a	74.40 a
T5 (25% inorganic and 75% organic)	1.07 b	6.80 b	7.97 ab	71.23 a	71.30 ab
T6 (100% organic).	1.00 b	6.93 b	5.90 b	71.43 a	74.67 a
LSD (P<0.05)	0.5	2.8	2.1	22.42	21.03

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

CONCLUSION AND RECOMMENDATION

It is concluded from this experiment that under the semi-arid condition of Peshawar valley organic and inorganic nitrogen should be applied in the ratio of 50% organic and 50% inorganic to oat for higher nutritive value and green fodder yield. As green fodder is one of the most important factors in animal feed and its proper nutrition is another vital factor, so by use of combine doze of organic and inorganic fertilizers this problem may be solved.

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