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EFFECT OF DIFFERENT LEVELS OF POULTRY MANURES ON YIELD AND YIELDING COMPONENTS OF MAIZE

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Abstract

Importance of Corn (Zea mays L.) is justified by its nutritious content especially because of the presence of high protein, minerals, vitamins and other energetic nutrients. Application of poultry manure has long been recognized the most important organic fertilizer in order to improves soil properties especially soil fertility by adding both major and essential nutrients as well as soil organic matter which improve moisture and nutrient retention. Present research focuses on the effectiveness of different levels of poultry manure (PM) on the growth and yield of maize. Research was conducted out at Agronomy Research Farm (ARF), The University of Agriculture Peshawar during summer season 2016. Three levels of PM (2, 5 and 9 t ha^{-1}) were studied along with the control treatment (No PM). The Experiment was laid out in randomized complete block design with four replications. It was found that all studied parameters except number of ears plant^{-1} were significantly affected by application of PM. Higher plant height (210cm), rows ear^{-1}(14), number of grains ear^{-1} (27), biological yield (12341 kg ha^{-1}), grain yield (4121 kg ha^{-1}), thousand grain weight (239g) and harvest index (21.8%) were recorded by the application of PM at 9 ton ha^{-1}.

Key words: Poultry manures, maize, yield and Yielding components

INTRODUCTION

Maize (*Zea mays L.*) is the third most important cereal after wheat and rice (Boateng et al., 2006). It is commonly cultivated in the tropics and warm sub-tropics for food, livestock and industrial uses. It can be successfully cultivated twice a year such as spring and Kharif crop. Maize has greater nutritional value as it contains about 72% starch, 10% proteins, 4.8% oil, 8.5% fiber, 3% sugar and 1.7% ash (Chaudhary, 1993).

Organic manures are important for improving soil conditions like soil aeration, water holding capacity, structure and crop yield however; the use of inorganic fertilizer is compulsory to obtain higher yield (Hammad et al., 2011). Response of crops to applied fertilizer depends on soil organic matter status. The quantity of soil organic matter depends on the quantity of organic material which can be introduced into the soil either by natural returns through roots, stubbles, sloughed-off root nodules and root exudates or by artificial application in the form of organic fertilizer such as manure (Agboola and Omueti, 1982). Application of organic fertilizer is an important means of maintaining soil fertility status and it is also environmentally friendly. This is

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because nutrients contained in organic manures are released more slowly and are stored for a longer time in the soil, thereby ensuring a long residual effect (Sharma and Mittra, 1991).

Poultry manure is an excellent organic fertilizer, in contrast to chemical fertilizers; it adds organic matter to soil that improves soil physical, chemical and biological/microbial properties of soil like soil structure, nutrient retention, aeration, soil moisture holding capacity, water infiltration and P availability to plants (Garg and Bahla, 2008). It is one of the most important component of organic farming (Ali et., 2011; Ali et al., 2015). Application of poultry manure has increased N level of the soil up to 53% (Boateng*et* al., 2006). Nitrogen, which is a major component of poultry manure, is associated with high photosynthetic activity, vigorous vegetative growth and a dark green coloration of the leaves (John et al., 2004 and Dauda et al., 2008). At the other extreme, excessive supply of nitrogen may result in luxury consumption and the production of vegetative growth at the expense of high grain yield. Poultry manure is rich source of nutrients like Nitrogen and Phosphorous and thus improving soil properties, enhancing availability of nutrients and thereby important for optimum plant growth and development.

Keeping in view the above facts, the present study was therefore, designed to evaluate the impact of different levels of poultry manures on the growth and yield of maize under agro climatic conditions of Peshawar.

MATERIAL AND METHODS

The Experiment entitled "Effect of different levels of Poultry Manures on yield and yield components of Maize" was conducted at at New Developmental Farm of The University of Agriculture Peshawar during Kharif 2015. Land was prepared with cultivator twice followed by planking. The experiment comprised of different levels of poultry manures (2 ton ha^{-1}, 5 ton $ha^{-1}$and 9 ton ha^{-1}) and Control treatment. Dried poultry manure was applied to the respective plots and incorporated into the soil two weeks before sowing. Chemical analysis of poultry manure and soil Nitrogen, phosphorous and potassium were done before experiment.

The Experiment was laid out in randomized complete block design with four replications. The variety Azam was sown on June 18, 2016 in plot size 4m×3m having 5 rows with 75 cm distance. All other agronomic practices were uniform for all treatments. Weeds were controlled by spraying the herbicide (Atrazine) and cultural practices like hand weeding and hoeing were also done. The field was ploughed twice by rotavator followed by planking. The field was irrigated as per requirement of the crop.

Chemical analysis of Poultry manure and soil

Organic Source	Nitrogen	Phosphorous	Potassium
Poultry manure	2.04 %	2.06 %	1.86 %
Soil	0.03 %	6.9 ppm	225.0 ppm

Data recording procedure: Standard procedures were followed to collect the data for growth and yield parameters. Ten plants from each plot were selected at random and their height was measured with the help of measuring tape and average was calculated from those ten measured values. Number of ears per plant were counted selecting ten plans in each subplot and averaged. From each plot, ten ears were selected, number of grain rows and number of grains per row were counted, averaged and grain numbers were calculated for each ear. From each plot, ten samples, each of 1000 grains, were randomly collected and their weight was recorded. After shelling, total grain weight of grains of each plot was recorded with a portable balance and grain yield was calculated. Crop was harvested and dried for ten days. After drying, overall biomass of each plot was obtained with the help of a weighing balance and then converted to $kgha^{-1}$. Harvest index (HI) of each plot was calculated by using the formula given by Hunt (1978).

Statistical analysis: Statistical analysis of the data collected during the course of this study were statistically analyzed using Fishers analysis of variance technique and significant means were separated using least significant difference test (LSD) at 5% probability level (Steel et al., 1997).

RESULTS AND DISCUSSION

Plant height (cm): Different application rate of poultry manure induced significant variation in plant height of maize (Table-1). Higher plant height

(210cm) was recorded in plots treated with 9 ton ha^{-1} of poultry manure followed by the application of 5 ton PM ha^{-1} (205 cm). Control plots resulted in short stature plants (162cm). Application of poultry manure released different nutrients especially nitrogen and Phosphorous needed for optimum growth and development that resulted in higher plant height. The increase in plant height with PM was mainly due to the reason of more availability of nutrients by PM throughout the growing season. These results revealed that PM has influence on maize plant height and the results are also in line with the (Ali et al., 2016; Manuwa et al., 2015 and Adelekanet et al., 2010) that maximum plant height can be obtained from the highest application of PM.

No of Ears plant^{-1}: Application of different application rates have Non-significant effect on no of ears per plants of maize (Table-1). It is the genetic potential of the variety of bearing ears. This may be attributed to the reason that ear bearing potential of a variety controlled by its genetic makeup rather than the agronomic practices. Non-significant effects of NP application on number of ears per plant Maqsood et al. (2001). The results are also in similar to the findings of Farhad et al. (2009) that the no of ears could not be effected by the application of poultry manure.

Rows ear^{-1}: Various application rates of poultry manures caused significant variations on No of rows per ear of maize (Table-1). Maximum number of rows per ear (14) were recorded in plots with 9 ton ha^{-1} of poultry manure followed by application rate 5 ton ha^{-1}(12 rows). Control treatment resulted in less number of rows (9) which were statistically non-significant with plots having 2 ton ha^{-1}. The reason of more availability of nutrients from PM throughout the growing season. These results are similar to the findings of Zhang et al. (1998) who reported that precise application of manure and mineral fertilizer to maize crop can be as effective as commercial N fertilizer for yield response. Results obtained from our study are similar to Warren et al. (2006) and Farhad et al. (2009) that the maximum no of rows per ear can be obtained by the high rate of poultry manure.

Grains row^{-1}: Results revealed that different rates of poultry manures application caused significant differences on grains number per row (Table1). Maximum number grains per row (27) were resulted in treatments having 9 ton ha^{-1} of poultry manure followed by 5 tons ha^{-1} (22 grains per row),2 tons ha^{-1} (20 grains per row) while control plots resulted in minimum number of grains per row (17). The increase in number of grains per row may be attributed to the availability of more nitrogen and other nutrients from PM required for plant development up to ear formation. These results are also in line with the Ali et al. (2016), Warren et al. (2006), Zhang et al. (1998) and Farhad et al. (2009) that the maximum no of grains per ear could be obtained by the high rate of poultry manure (10 ton ha^{-1}).

Biological yield (kg ha^{-1}): Different application rate of poultry manure induced significant variation in plant height of maize (Table-1). Maximum biological yield (12341 kg ha^{-1}) was observed in plots treated with 9 ton ha^{-1} of poultry manure followed by5 tons ha^{-1}(10432 kg ha^{-1}), 2 tons ha^{-1} (9654 kg ha^{-1})while control plots resulted in minimum biological yield (9432 kg ha^{-1}).Our findings are also in line with the Farhad et al. (2009) and Zhang et al. (1998) that the maximum biological yield can be obtained by the high rate of poultry manure application that due to the proper and balanced supply of nutrients to the plants throughout the growth period.

Grain Yield (kg ha^{-1}): Different application rate of poultry manure induced significant variation in grain yield of maize (Table 1). The higher grain yield (4121 kg ha^{-1}) was obtained from 9 ton ha^{-1} of poultry manure application followed by 5 tons ha^{-1}(3647 kg ha^{-1}), 2 tons ha^{-1} (3126 kg ha^{-1})while control plots resulted in minimum biological yield (2989 kg ha^{-1}).The reason may be that biomass (leaf and stem dry weight) and yield components (ear weight, ear length, ear diameter and 1000-seed weight) were also significantly increased with application of poultry manure which resulted in an overall increase in grain yield. (Zhang et al., 1998) who stated that maximum grain yield can be obtained by the high rate of poultry manure application.

Thousand Grain weight (g): Significant variations were resulted on thousand grain weight of maize by different application of poultry manures (Table-1). Maximum thousand grain weight (239g) was

obtained by the application of 9 ton ha^{-1} of poultry manure followed by 5 tons ha^{-1} (207), 2 tons ha^{-1}(199) and control plots resulted in minimum grain weight (132 g). These results are also in line with the Farhad et al. (2009) and Zhang et al. (1998) who observed increase in grain weight with increased level of Poultry manure which could be due to balanced supply of food nutrients throughout development of the maize plant and concluded that maximum grain weight (g) can be obtained by the high rate of poultry manure application.

Harvest Index (%): Different application rate of poultry manure induced significant variation on grain yield of maize (Table 1). Maximum harvest index (21.8%) was obtained by the application of 9 ton ha^{-1} of poultry manure followed 5 t ha^{-1}(17 %), 2 tons ha^{-1} (15 %) while the minimum harvest index (11 %) was obtained by control treatment. The results are also in agreement with the Mitchell and Tu. (2005), Farhad et al. (2009) and Ma et al. (1999) that the maximum harvest index (%) can be obtained by the high rate of poultry manure application.

Table 1: Plant height (cm), ears $plant^{-1}$, Rows ear^{-1}, Grains ear^{-1}, Biological yield kg ha^{-1}, Grain yield kg ha^{-1},thousand grains weight(g) and H.I (%) as affected by the different levels of poultry manures.

Poultry Manure	Plant height (cm)	Ears $Plant^{-1}$	Rows Ear^{-1}	Grains Ear^{-1}	Biological yield (kg ha^{-1})	Grain yield (kg ha^{-1})	Thousand grain weight (g)	Harvest Index (%)
Control	162c	1.00	9c	17d	9432c	2989d	132 c	11.3c
2 t ha^{-1}	198ab	1.00	9c	20c	9654abc	3126bc	199 bc	15.6c
5 t ha^{-1}	205a	1.00	11b	22ab	10432ab	3647b	207ab	17.7b
9 t ha^{-1}	210a	1.11	14a	27a	12341a	4121a	239a	21.8a
LSD (0.05)	**14.3**	Ns	**2.8**	**2.96**	**459.6**	**167.4**	**7.82**	**3.9**

CONCLUSION AND RECOMMENDATIONS

All the maize yield parameters were significantly affected by the different application of poultry manure except number of ears $plant^{-1}$ which was not significantly affected by the application of poultry manure. The tallest plants with more number of grain rows, number of grains per ear, heavier grains, higher biological and grain yield and harvest index by the application of 9 ton ha^{-1} of poultry manure.

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