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

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Abstract

Poultry manure has long been recognized the most desirable organic fertilizer. It improves soil fertility by adding both major and essential nutrients as well as soil organic matter which improve moisture and nutrient retention. The present study investigates the effectiveness of different levels of applied liquid poultry manure (LPM) on the growth and yield of maize (Zea mays L). Research was carried out at Agronomy Research Farm (ARF), The University of Agriculture Peshawar during summer season 2016. Experiment was comprised of different levels of poultry manures (4 tons ha⁻¹, 8 tons ha⁻¹ and 10 tons ha⁻¹) with control in randomized complete block design replicated three times. It was observed that all the attributes were significantly affected by the application of LPM. Higher plant height (220 cm), stem diameter (29.3 mm), number of leaves plant⁻¹ (16), ear diameter (4.99 cm), ear length (17.3 cm), grains ear⁻¹ (37), thousands grain weight (256.8 g), biological yield (13243 kg ha⁻¹), grain yield (4986 kg ha⁻¹), and harvest Index (26.4%) were obtained with the application of LPM @ 10 tons ha⁻¹. Maximum values for all these parameters were recorded with the application of 10 t ha⁻¹ LPM. Therefore, LPM @ 10 tons ha⁻¹ is concluded to be the optimum rate for achieving optimum growth and yield of maize.

Key words: Liquid Poultry Manure, Yield and Yield Components of maize

INTRODUCTION

Maize (Zea mays L.) is an important food and feed crop of the world and is often referred as “the king of grain crops”. It ranks third in world production after wheat and rice and is important cereal crop of Pakistan. It is grown extensively with equal success in temperate, subtropical and tropical regions of the world (Wasaya et al., 2012). It forms major dietary part of the millions of the people in the form of bread, cake and porridge in many parts of the world in Asia, Africa and America. Besides being an important food grain for human consumption, maize has also become a major component of livestock and poultry feed (Witt and Pasuquin, 2007). Maize is an important cereal crop that provides staple food to large number of people across the globe and is a major source of income to many farmers in developing countries (Tagneet al., 2008). It is a relatively short duration crop and capable of utilizing inputs to produce a large quantity of food grains per unit area. Organic fertilizers including farmyard manure, sheep manure and PM may be used for the crop production as a substitute of the chemical fertilizers because the
importance of the organic manures cannot be overlooked. Worldwide, there is growing interest in the use of organic manures due to depletion in the soil fertility. Economic premiums for certified organic grains have been driving many transition decisions related to the organic farming (Delate and Camberdella, 2004). Poultry manure had been reported to improve growth and yield of maize relative to no fertilizer (Adeniyan, and Ojeniyi, 2005; Ezeibekwe et al., 2009) and improves the chemical and biological qualities of the soil which increases crop productivity relative to chemical fertilizers (Obi and Ebo, 1995). Poultry manure application registered over 53% increases of N level in the soil, from 0.09% to 0.14% and exchangeable cations increase with manure application (Boateng et al., 2006). In agriculture, the main reasons for applying poultry manure include organic amendment of the soil and provision of nutrients to crops (Warren et al., 2006). Ketterings et al. (2013) evaluated the impact of manure application rate (84,000, 112,000, and 140,000 L/ha). They determined that an increase in manure rate beyond 84,000 L/ha did not increase yield. Land application of liquid manure has been recognized as a cost-effective and sustainable practice for manure utilization. Comparable or higher crop yields can be achieved when using liquid manure to replace chemical fertilizers (Chen and Tessier, 2001).

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

MATERIALS AND METHODS

To evaluate the effect of different application rates of Liquid Poultry Manure on growth and yield components of maize an experiment was conducted at Agronomy Research Farm (ARF), The University of Agriculture Peshawarduring summer season 2016. The experiment was laid out in RCB design having three replications. Liquid poultry manure was applied at the rate of 4, 8 and 10 tons ha⁻¹ with control treatment having no application of LPM. LPM was prepared about 20 days before sowing of the crop by putting the calculated amount in a container containing water for each experimental unit, which was stirred regularly. Solution was applied to the field one week before sowing. The plot size was 3 x 4 m² accommodating 5 rows with R-R distance 75 cm. Maize variety Babar was used for sowing and sowing was made on 17 June 2016. Irrigation was applied when needed by crop. Manual weed control was practiced to keep the field weed free.

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. Total number of leaves, Ear diameter and ear length were also measured from selected plants and then averaged for single plant. From each plot, ten ears were selected, number of grains rows and number of grains per row were counted, averaged and grain numbers were calculated for each cob. 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 kg ha⁻¹. Harvest index (HI) of each plot was calculated by using the formula given by Hunt (1978). Statistical analysis

The data collected were analyzed statistically by using Fisher’s analysis of variance technique and LSD at 5% probability was used to compare the differences among treatments’ means (Steel et al., 1997).

RESULTS AND DISCUSSION

Plant height: Data concerning plant height has given in Table 1. Statistical analysis of the data revealed that liquid poultry manure application has significantly affected plant height of maize. Plant height (cm) increases with increases with LPM up to 10 tons ha⁻¹ (220 cm). While dwarf plants (150 cm) were observed in control plots where no application of poultry manure was applied. These results revealed that LPM has influence on maize plant height and the results are also in line with the (Manuwa et al., 2015 and Adelekan et al., 2010) that maximum plant height can be obtained from the highest application of
LPM. The increase in plant height with PM was mainly due to the reason of more availability of nutrients by PM throughout the growing season. This result indicated that LPM has influence on maize plant height. This result is in agreement with Okoruwa (1998).

**Stem diameter:** Stem diameter of maize was significantly (P≤0.05) affected by liquid poultry manure different levels. Maximum stem diameter(29.3mm) was observed in plots of 9 tons ha⁻¹, whereas lesser stem girth(23.3mm) was observed in control plots (Table 1). It shows that the liquid poultry manure has an efficient effect on stem girth of maize. The results are also in line with the (Manuwa et al., 2015)

**Number of leaves plant⁻¹:** Statistical analysis of the data revealed that liquid poultry manure application has significantly affected number of leaves per plant of maize(Table 1). Maximum number of leaves plant⁻¹(16) was obtained with LPM up to 10 tons ha⁻¹, while less number of leaves per plant (13) was observed in control plot. The results are also in line with the (Adelekanet et al., 2010) that maximum number of leaves per plant can be obtained from the highest application of LPM.

**Ear diameter:** Ear diameter of maizeas influenced by different rats of LPM application is given in Table 1. Statistical analysis of the data revealed that liquid poultry manure application has significantly affected ear diameter of maize. Maximum ear diameter (4.99cm) was obtained with LPM up to 10 tons ha⁻¹, while minimum ear diameter (4.12cm) was recorded in control plot. The results are also in line with the (Garg and Bahla, 2008) that maximum ear diameter of the maize plant can be obtained from the highest application of LPM. It could be due to balanced supply of food nutrients from poultry manure throughout development of plant.

**Ear length (cm):** Length of ear(cm) as affected by LPM treatments is given Table 1. Statistical analysis of the data revealed that liquid poultry manure application has significantly affected ear length of maize. Maximum ear length (17.3cm) was obtained with LPM up to 10 tons ha⁻¹, while minimum ear length (12.3cm) was recorded in control plot. The results are also in line with the (Agbaet et al, 2012) that maximum ear length of the maize plant can be obtained from the highest application of LPM.

**Table 1. Plant height , stem diameter, number of leaves plant⁻¹, ear diameter, ear lengths as affected by different levels of LPM**

<table>
<thead>
<tr>
<th>Liquid Poultry Manure</th>
<th>Plant Height (cm)</th>
<th>Stem Diameter (mm)</th>
<th>Leaves per plant</th>
<th>Ear Diameter (cm)</th>
<th>Ear Length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>150 d</td>
<td>23.3 a</td>
<td>13 ab</td>
<td>4.12 a</td>
<td>12.3 b</td>
</tr>
<tr>
<td>4 tons/ha</td>
<td>180 c</td>
<td>26.9 a</td>
<td>14 b</td>
<td>4.37 a</td>
<td>14.4 a</td>
</tr>
<tr>
<td>8 tons/ha</td>
<td>200 b</td>
<td>28.4 a</td>
<td>14 b</td>
<td>4.66 a</td>
<td>14.9 a</td>
</tr>
<tr>
<td>10 tons/ha</td>
<td>220 a</td>
<td>29.3 b</td>
<td>16 a</td>
<td>4.99 b</td>
<td>17.3 a</td>
</tr>
<tr>
<td>Lsd</td>
<td>14.3</td>
<td>12.2</td>
<td>2.8</td>
<td>3.67</td>
<td>4.32</td>
</tr>
</tbody>
</table>

**Number of grains ear⁻¹:** Mean value of the data Table 2 showed that number of grains ear⁻¹ of maize was significantly (P≤0.05) affected by liquid poultry manure different levels. Significant number of grains ear⁻¹ (37) was observed in plots of 9 tons ha⁻¹, whereas lesser number of grains ear⁻¹ (27) was observed in control plots. It shows that the liquid poultry manure has an efficient effect on grains ear⁻¹ of maize. The results are also in line with the (Adelekanet et al., 2010)
Thousand grain weight (g): Thousands grain weight (g) response to LPM rates is given in Table 2. Statistical analysis of the data revealed that liquid poultry manure application has significantly affected thousands grain weight of maize. Maximum thousands grain weight (256.8g) was obtained with LPM up to 10 tons ha⁻¹, while less thousands grain weight (210.1g) recorded in control plot. The results are also in line with the (Agbaet et al., 2012) that maximum thousands grain weight of the maize plant can be obtained from the highest application of LPM.

Biological yield (kg ha⁻¹): Mean data regarding biological yield are shown in Table 2. Statistical analysis of the data showed that biological yield was significantly affected by the application of liquid poultry manures. Maximum biological yield (13243 kg ha⁻¹) was obtained with LPM up to 10 tons ha⁻¹, while Mean value of the data also showed that lower biological yield (7564 kg ha⁻¹) was produced in control plots where no application of LPM was applied. The results are also in line with the (Agbaet et al., 2012, Deksiisa et al., 2008 and Manuwa et al., 2015) that maximum harvest Index (%) of the maize plant can be obtained from the highest application of LPM.

Grain yield: Table 2 indicates grain yield response to different rates of LPM. Statistical analysis of the data revealed that liquid poultry manure application has significantly affected grain yield of maize. Maximum grain yield (4986 kg ha⁻¹) was obtained with LPM up to 10 tons ha⁻¹, while lesser grain yield (3107 kg ha⁻¹) was recorded in control plot. The results are also in line with the (Agbaet et al., 2012) that maximum grain yield of the maize plant can be obtained from the highest application of LPM.

Harvest Index (%): Differences were observed for harvest Index as affected by LPM rates are given in Table 2. Statistical analysis of the data revealed that liquid poultry manure application has significantly affected harvest Index of maize. Maximum harvest Index (26.4%) was obtained with LPM up to 10 tons ha⁻¹, while less harvest Index (21.3%) recorded in control plot. The results are also in line with the (Agbaet et al., 2012 and Manuwa et al., 2015) that maximum harvest Index (%) of the maize plant can be obtained from the highest application of LPM.

CONCLUSION

It was concluded from the study that maximum plant height, ear diameter, length, grains ear⁻¹, biological yield, grain yield, thousands grain weight and harvest Index was obtained with application of LPM at rate of 10 tons ha⁻¹. From present study, the application of LPM at rate of 10 ton ha⁻¹ is recommended for achieving optimum growth and yield of maize under the agro-climatic condition of Peshawar.

Table 2. Grains ear⁻¹, biological yield, grain yield, thousands grain weight and Harvest Index as affected by different levels of LPM

<table>
<thead>
<tr>
<th>Liquid Manure</th>
<th>Poultry Manure</th>
<th>No of grains ear⁻¹</th>
<th>Biological Yield (kg ha⁻¹)</th>
<th>Grain Yield (kg ha⁻¹)</th>
<th>thousand Grain weight (g)</th>
<th>Harvest Index (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>27 c</td>
<td>7564 d</td>
<td>3107 bc</td>
<td>210.1 c</td>
<td>21.3 bc</td>
</tr>
<tr>
<td>4 tons/ha</td>
<td></td>
<td>30 b</td>
<td>9345 c</td>
<td>3765 c</td>
<td>231.6 c</td>
<td>23.6 bc</td>
</tr>
<tr>
<td>8 tons/ha</td>
<td></td>
<td>33 a</td>
<td>10452 b</td>
<td>4168 b</td>
<td>243.6 b</td>
<td>24.7 bc</td>
</tr>
<tr>
<td>10 tons/ha</td>
<td></td>
<td>37 a</td>
<td>13243 a</td>
<td>4986 a</td>
<td>256.8 a</td>
<td>26.4 a</td>
</tr>
<tr>
<td>LSD</td>
<td></td>
<td>3.65</td>
<td>7.32</td>
<td>4.32</td>
<td>3.45</td>
<td>5.32</td>
</tr>
</tbody>
</table>

REFERENCES

