Introduction

Maize (Zea Mays L.; 2n = 20) is the third most important cereal crop of the world after wheat and rice. Maize has been an important cereal crop owing to its highest production potential and adaptability to wide range of environments hence called as ‘Queen of cereals’. Besides being a potential source of food for human being and quality feed for animals, maize serves as a basic raw material to the industry for production of starch, oil, protein, alcoholic beverages, food sweeteners and recently in extraction of biofuel. In India, maize is grown over an area of 8.33 million ha with a production of 16.68 million tonnes with the productivity of 2002 kg ha⁻¹. In Karnataka it is cultivated on an area of 1.07 million ha with production of 3.03 million tonnes and the productivity of 2833 kg ha⁻¹. The general area under organic production accounts for more than 31 million ha (Yadav, 2007). Among this Asian region constitutes 4.1 ha which includes manures for increasing soil fertility has gained importance in recent years due to high cost and adverse impact of fertilizers. At the same time exclusive organics like FYM, vermicompost, poultry manure and sheep manure alone do not result in significant increase in the crop yields, owing to their low nutrient status. Dependency on chemical fertilizers alone may not provide a viable economic option. In this context, a suitable blend of organic and inorganic sources is the need of the hour to harvest optimum yields besides sustaining the soil health.

In the present scenario, limited availability of farmyard manure is a major constraint as a source of nutrient. Poultry manure is now available in abundance due to development of poultry industry. Vermicompost is gaining popularity and can be produced at farmers’ level. Exclusive inorganic fertilizers in the long run may be detrimental for the soil environment. These sources can be judiciously to augment yields without dilapidation of soil health. By 2020, the requirement of maize for various sectors will be around 100mt, of which poultry sector needs 31mt. Hence, it is a challenging task for us to increase the maize production from the present level (Seshaiah, 2000). The sustainability of the maize production in the near future will greatly depend on integrated nutrient management approach (INM) using both organic and inorganic sources of nutrients. The concept of INM paves way for optimum plant nutrient supply to realize full yield potential of crop. However, continuous use of imbalanced fertilizers causes decline in soil fertility and yield reduction. Keeping these points in view, the present study was undertaken to investigate the effect of organics on growth and morpho-physiological characters in maize (Zea mays L.).

Materials and Methods

A field experiment was conducted during Kharif season of 2010-2011 to study the effect of organics on yield and yield components of maize (Zea mays L.) as influenced by different organic manures at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka). The experiment was laid out in Randomised block design replicated thrice with 14 treatment combinations including different levels of inorganic and organic fertilizers. The yield components of maize was found significant with different treatment combinations with highest cob length (16.93cm), maximum cob girth (16.82cm), highest number of grain rows per cob (17.67), grains/row (35.92), cob weight (175.6g plant⁻¹) and hundred grain weight (30.2g) were obtained from the treatment poultry manure (1.5 t ha⁻¹) + 100 % RDF followed by sheep manure (1.8 t ha⁻¹) + 100 % RDF. Similarly the highest grain yield, harvest index and shelling percentage was recorded in treatment poultry manure (1.5 t ha⁻¹) + 100 % RDF followed by sheep manure (1.8 t ha⁻¹) + 100 % RDF (90.20, 47.8 and 73.0).

Yield and yield components of maize as influenced by different organic manures

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Abstract: A field experiment was conducted during Kharif season of 2010-2011 to study the effect of organics on yield and yield components of maize (Zea mays L.) as influenced by different organic manures at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka). The experiment was laid out in Randomised block design replicated thrice with 14 treatment combinations including different levels of inorganic and organic fertilizers. The yield components of maize was found significant with different treatment combinations with highest cob length (16.93cm), maximum cob girth (16.82cm), highest number of grain rows per cob (17.67), grains/row (35.92), cob weight (175.6g plant⁻¹) and hundred grain weight (30.2g) were obtained from the treatment poultry manure (1.5 t ha⁻¹) + 100 % RDF followed by sheep manure (1.8 t ha⁻¹) + 100 % RDF. Similarly the highest grain yield, harvest index and shelling percentage was recorded in treatment poultry manure (1.5 t ha⁻¹) + 100 % RDF followed by sheep manure (1.8 t ha⁻¹) + 100 % RDF (90.20, 47.8 and 73.0).

Key words: Organic manures, Maize, FYM, Vermicompost, Poultry manure, Sheep manure and RDF

Table-1: Initial properties of the experimental sites

<table>
<thead>
<tr>
<th>Parameter Protocol</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Reaction (pH-1:2.5 soil water suspension)</td>
<td>Piper, 1966</td>
</tr>
<tr>
<td>Organic carbon (%)</td>
<td>Jackson, 1973</td>
</tr>
<tr>
<td>Available Nitrogen (kg ha⁻¹)</td>
<td>Jackson, 1973</td>
</tr>
<tr>
<td>Available Phosphorus (kg ha⁻¹)</td>
<td>Muth. et al 1965</td>
</tr>
<tr>
<td>Available potassium (kg ha⁻¹)</td>
<td>Jackson, 1973</td>
</tr>
</tbody>
</table>

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altering the relative proportion of different plant parts. It is a complex character which involves the interaction of several intrinsic and external factors. It largely depends upon the production and mobilization of carbohydrates, uptake of water and nutrients from the soil, in addition to several environmental factors to which plant is exposed during the growing period (Schaffer and Anderson, 1994).

The data on yield and yield components as influenced by organic manure indicated significant differences between the treatments (Table-2). The treatment $T_1$ recorded significantly higher cob length (16.93 cm), cob girth (16.82 cm), number of grain rows per cob (17.67), number of grains per row (35.92), cob weight (198.4 g) and grain weight (175.6 g) followed by treatment $T_2$ sheep manure + 100% RDF. The lowest yield and yield attributes were recorded in control. This is in line with the earlier workers Pattanashetti et al. (2002), who reported that application of 5 t ha$^{-1}$ FYM produced significantly higher yield attributes Viz., cob length, number of grains, rows per cob, number of grains per row, grain weight per plant and 100-grain weight as compared to vermicompost and control and these were on par with poultry manure. Significant differences were observed between the treatments with respect to grain yield, harvest index, test weight and shellling percentage (Table-2). Application of poultry manure + 100% RDF ($T_2$) recorded significantly higher grain yield (90.20 q/ha$^{-1}$), shellling percentage (73%), test weight (175.6 g) and harvest index (47.8%) which was on par with treatment $T_2$, $T_3$, $T_4$, and $T_5$, the lowest grain yield, shellning percentage, test weight and harvest index was recorded in control. Earlier works of Nagaraj et al. (2004) in this line revealed that application of poultry manure @ 5 t ha$^{-1}$ gave significantly higher grain yield of maize among organics and was followed by FYM @ 10 t ha$^{-1}$ and incorporation of green leaf manure @ 5 t ha$^{-1}$. Similarly Nanjappa et al. (2001) reported that combined application of 50 or 75 per cent RDF with 12 t FYM ha$^{-1}$ or 2.7 t vermicompost ha$^{-1}$ resulted higher productivity of maize compared with the application of either only inorganic fertilizer or organic sources.

Boochi and Tano, (1994) reported that the organic manures increased the grain yield of maize. The highest organic manure @ rate of 540 kg N ha$^{-1}$ as cattle manure produced the same yield as 180 kg N ha$^{-1}$ and positive interactions between combination of organic manure and nitrogen were observed. These results support the findings that application of vermicompost could substitute 25 to 50 percent of recommended dose of fertilizer to the crop. Shashidhar et al. (2009) reported that application of 125 percent NPK + application of poultry manure or N equivalent basis of recommended FYM recorded significantly higher grain yield of maize up to an extent of 38.83 percent over 100 percent NPK alone through inorganic fertilizer. Balai et al. (2011) noticed that combined application of FYM 10 t ha$^{-1}$ + recommended dose of NPK (120:60:30 kg ha$^{-1}$) recorded maximum grain and stover yield of maize compared to rest of the treatments. Present study indicated that combined application of poultry manure@1.5t+100% RDF or FYM@7.5t+100% RDF or vermicompost@3.75t+100% RDF or sheepmanure@1.87t+100% RDF could able to register higher grain yield of maize.

### References


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<table>
<thead>
<tr>
<th>Treatments</th>
<th>Cob length (cm)</th>
<th>Cob girth (cm)</th>
<th>Number of grain rows/cob</th>
<th>Number of grains per row</th>
<th>Cob weight (g)</th>
<th>Grain weight g plant$^{-1}$</th>
<th>Test weight (100 seeds)</th>
<th>Shelling %</th>
<th>Grains yield (q ha$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_0$ (control)</td>
<td>14.46</td>
<td>15.08</td>
<td>15.33</td>
<td>27.86</td>
<td>122.7</td>
<td>98.08</td>
<td>14.2</td>
<td>63.2</td>
<td>34.73</td>
</tr>
<tr>
<td>$T_1$ (FYM+100% RDF)</td>
<td>15.52</td>
<td>16.17</td>
<td>16.27</td>
<td>31.71</td>
<td>158.5</td>
<td>147.3</td>
<td>28.7</td>
<td>69.6</td>
<td>82.60</td>
</tr>
<tr>
<td>$T_2$ (Poultry manure+100% RDF)</td>
<td>16.02</td>
<td>16.20</td>
<td>16.33</td>
<td>32.55</td>
<td>175.4</td>
<td>154.2</td>
<td>29.2</td>
<td>70.0</td>
<td>82.80</td>
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<tr>
<td>$T_3$ (Sheep manure+100% RDF)</td>
<td>16.93</td>
<td>16.82</td>
<td>17.67</td>
<td>35.92</td>
<td>198.4</td>
<td>175.6</td>
<td>30.2</td>
<td>73.0</td>
<td>90.20</td>
</tr>
<tr>
<td>$T_4$ (FYM alone)</td>
<td>11.87</td>
<td>14.35</td>
<td>13.83</td>
<td>24.27</td>
<td>110.0</td>
<td>81.02</td>
<td>7.20</td>
<td>50.1</td>
<td>14.30</td>
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<tr>
<td>$T_5$ (Vermicompost alone)</td>
<td>12.58</td>
<td>14.60</td>
<td>14.50</td>
<td>23.74</td>
<td>112.1</td>
<td>91.12</td>
<td>9.40</td>
<td>50.2</td>
<td>17.10</td>
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<td>$T_6$ (Poultry manure alone)</td>
<td>13.42</td>
<td>15.05</td>
<td>15.17</td>
<td>27.53</td>
<td>120.7</td>
<td>96.06</td>
<td>12.9</td>
<td>62.7</td>
<td>25.57</td>
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<tr>
<td>$T_7$ (Sheep manure alone)</td>
<td>14.13</td>
<td>15.02</td>
<td>14.67</td>
<td>27.38</td>
<td>118.0</td>
<td>94.51</td>
<td>11.1</td>
<td>50.7</td>
<td>22.30</td>
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<tr>
<td>$T_8$ (FYM+50% RDF)</td>
<td>14.46</td>
<td>15.08</td>
<td>15.33</td>
<td>27.86</td>
<td>122.7</td>
<td>98.08</td>
<td>14.2</td>
<td>63.2</td>
<td>34.73</td>
</tr>
<tr>
<td>$T_9$ (Vermicompost+50% RDF)</td>
<td>14.48</td>
<td>15.35</td>
<td>15.50</td>
<td>26.60</td>
<td>125.7</td>
<td>110.3</td>
<td>17.1</td>
<td>65.9</td>
<td>39.43</td>
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<tr>
<td>$T_{10}$ (Poultry manure+50% RDF)</td>
<td>14.58</td>
<td>15.55</td>
<td>16.00</td>
<td>30.17</td>
<td>140.1</td>
<td>127.1</td>
<td>25.2</td>
<td>68.8</td>
<td>56.97</td>
</tr>
<tr>
<td>$T_{11}$ (Sheep manure+50% RDF)</td>
<td>14.52</td>
<td>15.45</td>
<td>15.83</td>
<td>29.13</td>
<td>129.5</td>
<td>120.7</td>
<td>18.3</td>
<td>66.1</td>
<td>44.63</td>
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<tr>
<td>$T_{12}$ (RDF only)</td>
<td>15.35</td>
<td>15.87</td>
<td>16.21</td>
<td>30.88</td>
<td>141.0</td>
<td>137.0</td>
<td>28.8</td>
<td>68.9</td>
<td>82.20</td>
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<tr>
<td>$T_{13}$ (Control)</td>
<td>11.4</td>
<td>13.00</td>
<td>13.17</td>
<td>22.93</td>
<td>69.1</td>
<td>52.9</td>
<td>6.2</td>
<td>48.7</td>
<td>9.60</td>
</tr>
</tbody>
</table>

RDF – Recommended dose of fertilizer

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