Research Article

Enhancing effect of TNAU micronutrient mixture on yield of hybrid maize

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Summary

A field experiment was conducted to evaluate the effect of TNAU micronutrient mixture on dry matter production, yield parameters and yield of hybrid maize COH (M)5 at Maize Research Station, Vagarai, Dindigul district. The experiment consisted of seven treatments which were replicated thrice in Randomized Block Design. The dry matter production of hybrid maize was recorded the highest in the treatment that received application of TNAU micronutrient mixture as Enriched FYM @ 30 kg ha⁻¹ along with 100 per cent recommended dose of fertilizers irrespective of the stages. Yield components like cob length, cob girth, number of rows per cob, number of grains per row and 100 grain weight were recorded highest in the above mentioned treatment. The grain yield of hybrid maize registered 33.5 per cent higher in the same treatment than farmers’ practice. Similar trend was observed for straw yield of hybrid maize.

Key words: Micronutrient mixture, Maize, Dry matter production, Yield parameters, Yield, Enriched farm yard manure

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Introduction

Maize (Zea mays L.) is the third most important cereal next to rice and wheat, in India. It is a versatile crop and can be grown in diverse environmental conditions and has multiple uses. Besides its use as food and fodder, maize is now gaining importance on account of its potential uses in manufacturing of starch, resins, syrups, ethanol, etc. It has got immense potential and is therefore called as “miracle crop” and also “queen of cereals”. Exploitative agriculture involving modern production technology with the introduction of high yielding hybrids coupled with use of high analysis fertilizers leads to deficiency of micronutrients. Fertilizer recommendations based on such valid considerations and by ensuring mixtures of macro and micro nutrients of the test crops help to boost the yield of crops and sustain high crop yields since they become ‘rationalized’ doses of fertilizers for crops. The concept of balanced fertilization paves the way for optimum plant nutrient supply to the full growth potential of crop and takes care of nutrient stress of soil. Hence, the present investigation was performed to evaluate the effect of micronutrient mixtures on dry matter production and yield of hybrid maize.

Resource and Research Methods

A field experiment was conducted at Maize Research Station, Vagarai, Dindigul district. The soil of the experimental site was sandy clay loam, non-saline and neutral in pH. The organic carbon content of the soil was low (0.32%). The available nutrient status of experimental soil was low in available nitrogen, medium in available phosphorus and high in available potassium. Regarding micronutrient status of experimental soil was sufficient in available copper and manganese and deficient in iron and zinc. The experiment was consisted of seven treatments which replicated thrice in Randomized Block Design. The treatments viz., T₁ – Farmers’ practice (Basal application of 50kg urea and 120 kg DAP ha⁻¹ without micronutrient mixture), T₂ – Farmers’ practice with micronutrient mixture as straight chemical fertilizer (50kg urea and 120 kg DAP ha⁻¹ + Dept. Agri. micronutrient mixture @...
12.5 kg ha\(^{-1}\) as straight chemical fertilizer, T\(_1\) – Farmers’ practice with micronutrient mixture as EFYM (50 kg urea and 120 kg DAP ha\(^{-1}\) + Dept. Agrl. micronutrient mixture @ 12.5 kg ha\(^{-1}\) as enriched farm yard manure), T\(_2\) – RDF, T\(_3\) – RDF with TNAU micronutrient mixture @ 30 kg ha\(^{-1}\) for hybrid as straight chemical fertilizer, T\(_4\) – RDF with TNAU micronutrient mixture @ 15 kg ha\(^{-1}\) for hybrid as enriched farm yard manure, T\(_5\) – RDF with TNAU micronutrient mixture @ 30 kg ha\(^{-1}\) for hybrid as enriched farm yard manure.

Maize seeds were sown on the side of the ridges by adopting a spacing of 60x30 cm at a depth of 5 cm. The recommended dose of fertilizer (RDF) for hybrid maize was 150:75:75 N, P\(_2\)O\(_5\), K\(_2\)O kg ha\(^{-1}\). Nitrogen was applied in three splits viz., 25: 50: 25 per cent as basal, 25 and 45 DAS, respectively. The entire dose of phosphorus was applied basally. The potassium was applied in two equal split doses viz., basal and at 45 DAS. The N, P and K fertilizers were applied in the form of urea (46 % N), single super phosphate (16 % P\(_2\)O\(_5\)) and muriate of potash (60 % K\(_2\)O), respectively.

The micronutrient mixture contained the mixtures of micronutrient fertilizers like iron sulphate, copper sulphate, zinc sulphate, manganese sulphate and sodium molybdate. The Micronutrient enriched farm yard manure was made by physical mixing of the micronutrient fertilizer mixture with the organic manure at friable moisture in 1: 10 ratio and incubation for one month and then used for field application. The details of TNAU micronutrient mixture are given in Table A.

### Research Findings and Discussion

The results of the present study as well as relevant discussions have been presented under following sub heads:

#### Dry matter production (DMP):

The dry matter production of hybrid maize was recorded at three stages viz., 30 DAS, 60 DAS and harvest stage (Table 1). The dry matter production was significantly increased with the advancement of the crop stage. The dry matter production ranged between 8.60 to 10.29, 48.62 to 67.97, 107.10 to 123.30 q ha\(^{-1}\) at 30 DAS, 60 DAS and harvest stage, respectively. The DMP was higher under RDF with TNAU micronutrient mixture @ 30 kg ha\(^{-1}\) as enriched farm yard manure (T\(_7\)) irrespective of the stages than other treatments which was followed by RDF with TNAU micronutrient mixture @ 15 kg ha\(^{-1}\) as enriched farm yard manure (T\(_6\)). This might be due to increased NPK and micronutrients uptake by maize, which directly influences the plant growth and development through better utilization of photosynthesis, resulted in an increased biomass (Jogdand et al., 2008). At all stages of crop growth, the lowest dry matter production was recorded in farmers’ practice.

#### Yield parameters:

The yield attributes like cob girth, cob length, number of rows per cob, number of grains per row and 100 grains weight was significantly influenced by application of macro and micronutrients.
micronutrients (Table 1). Cob length and cob girth ranged between 17.33 to 20.53 cm and 13.37 to 15.27 cm, respectively. Number of rows per cob and number of grains per row ranged between 14.33 to 17.67 and 37.67 to 42.00, respectively. 100 grain weight of hybrid maize ranged between 38.71 g to 45.02 g. Yield parameters were registered higher in application of RDF with TNAU micronutrient mixture @ 30 kg ha⁻¹ for hybrid as enriched farm yard manure (T₁) than all the rest of treatments. Invariably, all the yield parameters recorded the lowest yield value recorded in farmers’ practice. The increased yield parameters of hybrid maize might be due to combined application of micronutrients with major nutrients. This finding is in line with the findings of El-Nagar (2002). The results also revealed that number of rows per cob has not shown significant variations among the treatments.

**Grain and straw yield:**

The grain yield of hybrid maize ranged between 38.53 to 51.43 q ha⁻¹ (Table 2) The highest grain yield was recorded in the treatment RDF with TNAU micronutrient mixture @ 30 kg ha⁻¹ as enriched farm yard manure (T₁). The yield increase of maize in the above mentioned treatment was 34 per cent higher when compared to farmers’ practice. The increase in yield was probably due to effective utilization of applied nutrients, increased sink capacity and nutrient uptake by crop. The yield potential of maize is mainly governed by the growth and yield components. The positive and significant improvement in yield attributes and nutrient uptake would have resulted in enhanced grain yield. The findings are in line with the findings of Maddonni et al. (2006). Straw yield of hybrid maize ranged between 65.59 to 76.83 q ha⁻¹. Straw yield of hybrid maize also recorded the highest in the above said treatment as that of grain yield. The enriched farmyard manure might have influenced the micronutrient availability to the crop throughout the growth period which might be the reason for higher availability of major and micronutrients for crop development (Meena et al., 2007).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain yield</th>
<th>Percentage increase over farmers’ practice (%)</th>
<th>Straw yield</th>
<th>Percentage increase over farmers’ practice (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>38.53</td>
<td>-</td>
<td>65.59</td>
<td>-</td>
</tr>
<tr>
<td>T₂</td>
<td>38.68</td>
<td>0.39</td>
<td>66.74</td>
<td>1.75</td>
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<tr>
<td>T₃</td>
<td>38.77</td>
<td>0.62</td>
<td>68.87</td>
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<td>T₄</td>
<td>45.17</td>
<td>17.23</td>
<td>69.85</td>
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</tr>
<tr>
<td>T₅</td>
<td>48.47</td>
<td>25.80</td>
<td>70.27</td>
<td>6.49</td>
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<tr>
<td>T₆</td>
<td>49.70</td>
<td>28.99</td>
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<tr>
<td>T₇</td>
<td>51.43</td>
<td>33.48</td>
<td>76.83</td>
<td>17.14</td>
</tr>
<tr>
<td>S.E. ±</td>
<td>0.83</td>
<td></td>
<td>1.39</td>
<td></td>
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<tr>
<td>C.D.(0.05)</td>
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**Conclusion:**

From the present investigation, it is clearly evident that the application of 100% RDF with TNAU micronutrient mixture @ 30 kg ha⁻¹ for hybrid as enriched farmyard manure proved better compared to other treatments with respect to the dry matter production, yield parameters, grain and straw yield. The yield increase in the above said treatment was 34 per cent higher when compared to farmers’ practice. Hence, it is concluded that recommended dose of fertilizers (NPK) with TNAU micronutrient mixture @ 30 kg ha⁻¹ as enriched farmyard manure for hybrid maize may be recommended to maximize the yield of crop with sustainable soil fertility.

**Literature Cited**


