Yield Parameters and Yield of Quality Protein Maize (QPM) as Influenced by Sulphur Levels and Method of Application

INTRODUCTION
Maize (Zea mays L.) is an important food and feed crop among cereals which occupies third rank after wheat and rice in the world and has high production potential compared to any other cereal crop. Hence, it is called as the “Queen of cereals”. In India, about 35% of maize produced is used for human consumption, 25% each as poultry and cattle feed and 15% in food and remaining used in industries for production of corn flakes, pop corn, starch, dextrose, corn syrup and corn oil etc. (Channabasamma, 2013).

Maize is being cultivated in 6.29 million ha area in India, with grain production of 10.3 million tonnes and average productivity of 16.4 q ha\(^{-1}\). In Telangana total cropped area is 7.52 lakh ha with production and productivity of 35.25 lakh tonnes and 4.69 t ha\(^{-1}\) respectively. (Annual Report of Indian Institute of Maize Research, 2013). In many developing countries of Latin America, Africa and Asia, maize accounts for 15% protein and 20% of calories in world food diet. But unfortunately the nutritional profile of maize is poor as it is deficient in essential amino acids such as lysine and tryptophan. This is leading to poor net protein utilization, malnutrition and low biological value of traditional maize varieties (Vasal, 1999). To minimize malnutrition in developing countries, normal maize is replaced by quality protein maize developed by CIMMYT to ensure better income to the farmers, food and nutritional security to the consumers, where maize is consumed as staple food (FAO, 2004).

It is being realized that apart from the major nutrients, the role of secondary nutrients in general and sulphur in particular in increasing cereal production is well established (Jamal et al., 2005). Sulphur is retaining importance in all regions of the world because of frequent sulphur deficiencies in time and space. Sulphur improves crop management through its favourable effect on environmental stress, resistance against pest and diseases (Luit et al., 1999). When S is deficient in soil, full yield potential of the crop cannot be realized regardless of other nutrients even under good crop husbandry practices (Tandon, 1989). Updation of sulphur recommendation to maize is currently focused, therefore it would be a very opportune time to look at split applications of sulphur, to determine if timing should be considered for farmers growing maize. (Ahmad et al., 1998). In light of the above the present investigation on sulphur levels and methods of application was taken up.

MATERIAL AND METHODS
The field experiment entitled “Response of Quality protein Maize to sulphur fertilization” was conducted at College farm, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad during kharif 2014. Experimental soil was sandy loam, neutral in reaction, low in organic carbon, available nitrogen and sulphur, medium in available phosphorous and high in potassium. Experiment was carried out with four sulphur levels (S\(_1\): 10 kg ha\(^{-1}\), S\(_2\): 20 kg ha\(^{-1}\), S\(_3\): 30 kg ha\(^{-1}\) and S\(_4\): 40 kg ha\(^{-1}\)) as first factor and method of sulphur application (M\(_1\): 100% basal as single dose; M\(_2\): two split applications-50% each at basal and knee heigh stage). Among four sulphur levels 40 kg S ha\(^{-1}\) had resulted in higher cob length, cob girth, no. of grains per cob, test weight, grain and stover yield. Similarly, between the two method of application-M\(_2\), split application of sulphur at basal and knee heigh stage showed maximum cob length, cob girth, no of grains per cob, test weight, grain and stover yield compared with basal application of sulphur (M\(_1\)).

Quality protein maize hybrid (HQPM-1) was sown in kharif 2014 at a spacing of 60 cm x 20 cm. A uniform dose of 80 kg P\(_2\)O\(_5\) and potassium @ 60 kg ha\(^{-1}\) was applied to all the treatments. Entire dose of phosphorous and half of potassium were applied at sowing. Nitrogen was applied as per the treatments through urea in three equal splits (at basal, knee-heigh and tasseling stages). Similarly the remaining potassium and nitrogen was top dressed at tasseling stage. Sulphur was applied through gypsum in two methods of applications i.e. M\(_1\): 100% basal application at; M\(_2\): two split applications-50% each at basal and knee heigh stage as per the treatments.

RESULTS AND DISCUSSION
Yield parameters
Data on yield attributes is presented in Table 1. Application of sulphur at varied levels and method of application significantly influenced yield attributing characters like cob length, cob girth, number of grains per cob, test weight etc.

Application of 40 kg S ha\(^{-1}\) recorded maximum cob length (15.2 cm), cob girth (13.1 cm), number of grains per cob (331) and test weight (26.6 g) and minimum cob length (13.0 cm), cob girth

| NAVATHA, N | Department of Agronomy, 4- Department of Soil Science and chemistry College of Agriculture |
| VANI, K.P | Department of Agronomy, 4- Department of Soil Science and chemistry College of Agriculture |
| Sринivas, A | Department of Agronomy, 4- Department of Soil Science and chemistry College of Agriculture |
| SUREN德拉 BABU P | Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad - 500030 |

ABSTRACT
Field experiment was conducted during Kharif 2014 at College farm, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad to study the yield parameters and yield of quality protein maize (QPM) as influenced by sulphur levels and method of application. The experiment was conducted in sandy loam by adopting factorial randomized block design (FRBD) with three replication and eight treatment combinations. The experiment was carried out with four sulphur levels (10 kg ha\(^{-1}\), 20 kg ha\(^{-1}\), 30 kg ha\(^{-1}\) and 40 kg ha\(^{-1}\)) and two method of sulphur application (M\(_1\): 100% basal as single dose; M\(_2\): two split applications-50% each at basal and knee heigh stage). Among four sulphur levels 40 kg S ha\(^{-1}\) had resulted in higher cob length, cob girth, no. of grains per cob, test weight, grain and stover yield. Similarly, between the two method of application- M\(_2\), split application of sulphur at basal and knee heigh stage shown maximum cob length, cob girth, no of grains per cob, test weight, grain and stover yield compared with basal application of sulphur (M\(_1\)).
(11.0 cm), number of grains per cob (277) and test weight (23.1 g) were obtained with 10 kg S ha⁻¹. Split application of sulphur as basal and at knee heigh stage (M₂) had shown increased cob length (14.5 cm), cob girth (12.3 cm), number of grains per cob (305) and test weight (24.4 g) when maize ferti-

 Yield

Grain and stover yield of quality protein maize was significantly influenced by levels and method of application of sulphur. The data is presented in Table 4.2. Grain (5985 kg ha⁻¹) and stover yield (7272 kg ha⁻¹) increased with increasing levels of sulphur. Among methods of sulphur application, grain (5659 kg ha⁻¹) and stover yield (6880 kg ha⁻¹) were recorded highest with split ap-

CONCLUSION

From this investigation it can be concluded that, out of four lev-

<table>
<thead>
<tr>
<th>Sulphur levels (S)</th>
<th>Basal (M₁)</th>
<th>Split (M₂)</th>
<th>Mean</th>
<th>Basal (M₁)</th>
<th>Split (M₂)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>S₁ : 10 kg ha⁻¹</td>
<td>4658</td>
<td>5189</td>
<td>4923</td>
<td>5948</td>
<td>6507</td>
<td>6227</td>
</tr>
<tr>
<td>S₂ : 20 kg ha⁻¹</td>
<td>5260</td>
<td>5409</td>
<td>5335</td>
<td>6536</td>
<td>6685</td>
<td>6611</td>
</tr>
<tr>
<td>S₃ : 30 kg ha⁻¹</td>
<td>5628</td>
<td>5696</td>
<td>5662</td>
<td>6919</td>
<td>6939</td>
<td>6929</td>
</tr>
<tr>
<td>S₄ : 40 kg ha⁻¹</td>
<td>5862</td>
<td>6108</td>
<td>5985</td>
<td>7162</td>
<td>7381</td>
<td>7272</td>
</tr>
</tbody>
</table>

Mean 5352 5600 6641 6878

CD (p=0.05) SEm± CD (p=0.05)

S 102 298 110 322
M 72 210 77 225
S x M 144 NS 155 NS

M₁: 100% basal application of sulphur; M₂: Sulphur as 50% basal+50% at knee heigh stage.