STCR based fertilizer recommendation with sorghum *(Sorghum bicolor L.)* gradient experiment in alluvial soil

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**Abstract**
To study the effect of N, P, K fertilizers on sorghum, a gradient experiment was conducted at Agriculture Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi Uttar Pradesh India during 2019-20 in kharif season. NPK, NPKS, NPK and NP:PK, fertilizer levels were applied to strip I, II and III, respectively. NPK were applied through urea, single super phosphate and muriate of potash fertilizers respectively. Sorghum Var.CH-28 was grown as a gradient crop. At harvest plant samples were collected and analyzed for NPK content and calculated total uptake of nutrients. Grain and straw yields of sorghum were also recorded. The results revealed that an application of graded levels of NPK fertilizers significantly influenced NPK uptake, grain and straw yields of sorghum crop.

**Keywords:** Sorghum, gradient, experiment, nutrient uptake and available nutrient

**Introduction**
Sorghum *(Sorghum bicolor L.)* is the most important cereal crop after wheat, rice, maize and barley. Sorghum species are native to tropical and subtropical regions of Africa and Asia. Maharashtra, Uttar Pradesh, Madhya Pradesh, Rajasthan, and Tamil Nadu are the major sorghum growing states. Other states grow sorghum in small areas primarily for green fodder.

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Soil samples (0-15 cm) from three strips were collected and analyzed for available nitrogen, by the alkaline permanganate method (Subbiah and Asija, 1956) [3]; available phosphorus, by Olsen et al. (1954) [4] and available potassium, by the ammonium acetate method (Hanway and Heidal, 1952) [5] as described by Jackson (1973) [6]. In 2010, selected site of 1269.6 square meter dimension was divided into three strips of equal size and in each strip, different fertilizer dose, low - 0, 0, 0, medium – 120, 60, 60 and high – 240, 120, 120 kg ha⁻¹ N, P₂O₅, K₂O, respectively were applied to develop a fertility gradient and sorghum variety CHS-28 was grown as an exhaust crop during Kharif 2019-20 for stabilizing fertility gradient in field. At maturity, sorghum crop harvested, grain and straw yield from each strip was recorded. Plant samples were also collected from each strip and analyzed for content of nitrogen, phosphorus, potassium and calculated uptake of nutrients by standard method (Jackson, 1973)[7].

### Results and Discussion

#### Yield

The grain yield of gradient crop sorghum variety CHS-28 in strip I, II and III were 1734 kg ha⁻¹, 2505 kg ha⁻¹ and 3528 kg ha⁻¹ respectively. The straw yield registered in strip I, II and III were 6845, 8251 and 9274 kg ha⁻¹. This might be due to better total nutrient uptake by the crop which favorably influenced the growth and yield of wheat as reported by Santhi and Selvakumari (1999) [10].

#### Nutrient uptakes

The results of N, P and K total nutrient uptake by sorghum crop, grain and straw yield are given in table 1. The total nutrient uptake of strip I, II and III were 1734 kg ha⁻¹, 2505 kg ha⁻¹ and 3528 kg ha⁻¹ respectively. The straw yield registered in strip I, II and III were 6845, 8251 and 9274 kg ha⁻¹. This might be due to better total nutrient uptake by the crop which favorably influenced the growth and yield of wheat as reported by Santhi and Selvakumari (1999) [10].

### Soil Characteristics

The soil test values after crop harvest give significant effect of fertilizer treatment on soil properties. The pH, EC and organic matter content increases. The pH of strip I, II and IIIrd were 7.82, 8.0 and 8.1, respectively. The EC of strip, I, II and IIIrd were 0.247, 0.259 and 0.267 (dS m⁻¹), respectively.

<table>
<thead>
<tr>
<th>Strips</th>
<th>Fertilizer dose application (kg ha⁻¹)</th>
<th>Grain yield (kg ha⁻¹)</th>
<th>Straw yield (kg ha⁻¹)</th>
<th>Total Nutrient uptake (kg ha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P₂O₅</td>
<td>K₂O</td>
<td>Total N</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1734</td>
</tr>
<tr>
<td>II</td>
<td>120</td>
<td>60</td>
<td>60</td>
<td>2505</td>
</tr>
<tr>
<td>III</td>
<td>240</td>
<td>120</td>
<td>120</td>
<td>3528</td>
</tr>
</tbody>
</table>

### Conclusion

From the STCR gradient crop experiment, it is concluded that an application of graded levels of NPK fertilizers significantly influenced total NPK uptake, grain and straw yield of sorghum crop. Therefore, soil test based fertilizer recommendation a useful tool for balanced nutrition of crops but also able to improve the soil health and economic condition of farmers, and also able to maintain agricultural as well as environmental sustainability.

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### References

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