YIELD AND YIELD COMPONENTS OF AEROBIC RICE AS INFLUENCED DRIP FERTIGATION

Balaji Naik, D, 2Krishna Murthy, R. & 3Pushpa, K.
1&2 Soil and Water Management, Zonal Agricultural Research Station, V.C. Farm, Mandya – 571 405
3 Department of Agronomy, College of Agriculture, V.C. Farm, Mandya – 571 405
Corresponding author e-mail: srkmurthyssac@gmail.com

ABSTRACT
Over the past decade, we have witnessed a growing scarcity and competition for water around the world. As the water demand for domestic, municipal, industrial and environmental purposes rises in the near future, the water availability for agriculture sector gets affected. A field experiment was conducted during Kharif 2014 to study the influence of drip fertigation on growth and yield of aerobic rice at Zonal Agricultural Research Station, V.C. Farm, Mandya. Irrigation @150 % CPE + DF 125 % RDF recorded higher grain yield (49.63 q ha\(^{-1}\)), straw yield (51.82 q ha\(^{-1}\)), number of productive tillers (25.10), more number of panicles m\(^{-2}\) (230.00), higher panicle length (23.53 cm), higher panicle weight (4.17 g hill\(^{-1}\)), total number of grains per panicle (110.50), and higher thousand grain weight (110.50 g) and it was on par with irrigation @125 % CPE + DF 125 % RDF (48.83 q ha\(^{-1}\)). However, significantly lower grain yield (32.28 q ha\(^{-1}\)) was observed with irrigation @100 % CPE+ DF 75 % RDF.

KEY WORDS: Drip, fertigation, cumulative pan evaporation, soil moisture

INTRODUCTION
Today farming is more commercialized and there is a growing awareness on the need for improved efficient management of inputs such as water, nutrition and management of pest. It is estimated that 88% of the total available water is being currently used in agriculture. Due to indiscriminate use of irrigation water and fertilizer, fertile soils have become waterlogged and saline. Water and fertilizer are the two basic inputs in irrigated agriculture. When water becomes scarce due to increased industrialisation, intensive agriculture and also now a days because of increased fertilizer cost there is necessary for adoption of agronomic techniques which help for effective utilization of both the inputs. The use of micro irrigation techniques and fertigation is only way to manage these resources efficiently.

MATERIAL & METHODS
Study site
Field experiment was conducted during Kharif season of 2014 at Zonal Agricultural Research Station, (ZARS), V.C. Farm, Mandya situated in the Southern Dry Zone (Zone – 6) of Karnataka. The experimental site is located between 12º 51' and Latitude and 77º 35' E Longitude at an altitude of 930 m above mean sea level (MSL). The soil was sandy loam with organic carbon content of 0.47 per cent. The initial nitrogen, phosphorus and potassium status of the soil were 158.3, 16.8 and 165.2 kg per ha respectively. The soil pH was 7.3 with an EC of 0.09 dsm\(^{-1}\). The experiment was laid randomized complete block design with ten treatments and three replications.

T\(_1\): Irrigation @100 % CPE + DF 75 % RDF
T\(_2\): Irrigation @125 % CPE + DF 75 % RDF
T\(_3\): Irrigation @150 % CPE + DF 75 % RDF
T\(_4\): Irrigation @100 % CPE + DF 100 % RDF
T\(_5\): Irrigation @125 % CPE + DF 100 % RDF
T\(_6\): Irrigation @150 % CPE + DF 100 % RDF
T\(_7\): Irrigation @100 % CPE + DF 75 % RDF
T\(_8\): Irrigation @125 % CPE + DF 75 % RDF
T\(_9\): Irrigation @150 % CPE + DF 75 % RDF
T\(_{10}\): Conventional method - flooded condition

RESULTS & DISCUSSION
The grain yield in any crop is dependent upon the photosynthetic source it can build up. A sound source internms of plant height, number of tillers to support and...
Grain and straw yield as influenced by levels of irrigation and fertigation treatments. Treatment (T₉) irrigation @150 % CPE + DF 125 % RDF recorded significantly higher straw yield (51.82 q ha⁻¹) (Table 2 and Fig 1.), when compared to (T₁) irrigation @100 % CPE + DF 75 % RDF (33.63 q ha⁻¹) might be due to higher plant height (31.77 cm), more number of tillers (40.00), higher leaf area (3671.67 cm²) and higher total dry matter production (111.33 g hill⁻¹). This is in conformity with Gururaj (2013) and Pushpa et al. (2007b). Higher straw yield is attributed to higher dry matter production accumulation due to higher photosynthetic activity resulting in production of higher photosynthates leading to better growth parameters. The higher leaf area as contributed for better light interception and crop growth and yield. The more absorption of water and nutrients is related to higher root volume and root length. Further, significantly higher chlorophyll content in fertigation treatments over soil application resulted in production of higher photosynthates that could be attributed for higher yield. The results are in conformity with the findings of Vijaykumar (2009) and Soman (2012) in rice. They attributed that higher number of productive tillers were due to continuous availability of water and nutrients that resulted in higher uptake of nutrients in turn production of higher dry matter under drip fertigation treatments. The increase in yield attributes under drip fertigation might be due to enhanced availability and uptake of nutrients leading to enhanced photosynthesis, expansion of leaves and translocation of nutrients to reproductive parts compared to conventional method of soil application of nutrients. Similar findings were also recorded by Parthasarathi et al. (2012). Increased nutrient availability and absorption by the crop at the optimum moisture supply coupled with frequent nutrient supply by fertigation and consequent better formation and translocation of assimilates from source to sink might have increased seed yield under fertigation. Application of fertilizer nutrients through irrigation systems (fertigation) has been found to increase grain yield (Soman, 2012).

![FIGURE 1. Grain and straw yield as influenced by levels of irrigation and fertigation](image_url)
TABLE 1. Yield parameters of aerobic rice as influenced by levels of irrigation and drip fertigation

<table>
<thead>
<tr>
<th>Treatments</th>
<th>No. of productive tillers hill-1</th>
<th>No. of panicle m-2</th>
<th>Panicle length (cm)</th>
<th>Panicle weight (g hill-1)</th>
<th>Total No. of grains panicle-1</th>
<th>Thousand grains weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Irrigation @100 % CPE + DF 75 % RDF</td>
<td>15.27</td>
<td>212.67</td>
<td>19.57</td>
<td>3.07</td>
<td>70.40</td>
<td>17.70</td>
</tr>
<tr>
<td>T2: Irrigation @125 % CPE + DF 75 % RDF</td>
<td>15.77</td>
<td>217.67</td>
<td>20.30</td>
<td>3.28</td>
<td>72.07</td>
<td>17.92</td>
</tr>
<tr>
<td>T3: Irrigation @150 % CPE + DF 75 % RDF</td>
<td>17.67</td>
<td>221.00</td>
<td>21.30</td>
<td>3.39</td>
<td>77.60</td>
<td>19.27</td>
</tr>
<tr>
<td>T4: Irrigation @100 % CPE + DF 100 % RDF</td>
<td>18.33</td>
<td>222.33</td>
<td>21.20</td>
<td>3.40</td>
<td>82.27</td>
<td>20.43</td>
</tr>
<tr>
<td>T5: Irrigation @125 % CPE + DF 100 % RDF</td>
<td>21.97</td>
<td>224.67</td>
<td>21.53</td>
<td>3.53</td>
<td>94.29</td>
<td>21.50</td>
</tr>
<tr>
<td>T6: Irrigation @150 % CPE + DF 100 % RDF</td>
<td>22.13</td>
<td>225.33</td>
<td>21.83</td>
<td>3.67</td>
<td>99.36</td>
<td>22.37</td>
</tr>
<tr>
<td>T7: Irrigation @100 % CPE + DF 125 % RDF</td>
<td>19.67</td>
<td>223.00</td>
<td>21.63</td>
<td>3.48</td>
<td>88.63</td>
<td>21.37</td>
</tr>
<tr>
<td>T8: Irrigation @125 % CPE + DF 125 % RDF</td>
<td>23.10</td>
<td>227.00</td>
<td>22.67</td>
<td>3.79</td>
<td>105.93</td>
<td>22.67</td>
</tr>
<tr>
<td>T9: Irrigation @150 % CPE + DF 125 % RDF</td>
<td>25.10</td>
<td>230.00</td>
<td>23.53</td>
<td>4.17</td>
<td>110.50</td>
<td>23.47</td>
</tr>
<tr>
<td>T10: Conventional method- flooded condition (UAS package)</td>
<td>16.53</td>
<td>219.33</td>
<td>20.33</td>
<td>3.31</td>
<td>75.34</td>
<td>18.75</td>
</tr>
</tbody>
</table>

Note: CPE: Cumulative pan evaporation, DF: Drip fertigation, RDF: Recommended dose of fertilizers

TABLE 2. Grain yield, straw yield and harvest index as influenced by levels of irrigation and drip fertigation

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain yield (q ha-1)</th>
<th>Straw yield (q ha-1)</th>
<th>Harvest index</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Irrigation @100 % CPE + DF 75 % RDF</td>
<td>32.28</td>
<td>33.63</td>
<td>0.489</td>
</tr>
<tr>
<td>T2: Irrigation @125 % CPE + DF 75 % RDF</td>
<td>36.52</td>
<td>37.37</td>
<td>0.494</td>
</tr>
<tr>
<td>T3: Irrigation @150 % CPE + DF 75 % RDF</td>
<td>43.36</td>
<td>43.94</td>
<td>0.496</td>
</tr>
<tr>
<td>T4: Irrigation @100 % CPE + DF 100 % RDF</td>
<td>45.87</td>
<td>46.92</td>
<td>0.494</td>
</tr>
<tr>
<td>T5: Irrigation @125 % CPE + DF 100 % RDF</td>
<td>47.39</td>
<td>48.18</td>
<td>0.495</td>
</tr>
<tr>
<td>T6: Irrigation @150 % CPE + DF 100 % RDF</td>
<td>47.71</td>
<td>49.26</td>
<td>0.499</td>
</tr>
<tr>
<td>T7: Irrigation @100 % CPE + DF 125 % RDF</td>
<td>46.34</td>
<td>47.37</td>
<td>0.494</td>
</tr>
<tr>
<td>T8: Irrigation @125 % CPE + DF 125 % RDF</td>
<td>48.83</td>
<td>49.53</td>
<td>0.496</td>
</tr>
<tr>
<td>T9: Irrigation @150 % CPE + DF 125 % RDF</td>
<td>49.63</td>
<td>51.82</td>
<td>0.489</td>
</tr>
<tr>
<td>T10: Conventional method- flooded condition (UAS package)</td>
<td>38.64</td>
<td>39.49</td>
<td>0.494</td>
</tr>
</tbody>
</table>

Note: CPE: Cumulative pan evaporation, DF: Drip fertigation, RDF: Recommended dose of fertilizers

Mean ± SD, *P* < 0.05
Comparatively lower grain yield under flooded condition with soil application of nutrients might be attributed to decrease in synthesis of metabolites and reduction in absorption and translocation of nutrients from soil to plant. The physiological response of plants by decreased cell division and cell elongation under moderate moisture stress at wider irrigation intervals might have also contributed to reduced grain yield. The results are in conformity with the findings of Sundrapandiyan (2012).

CONCLUSION
The results of the present study showed that the 150 % irrigation based on cumulative pan evaporation and 125 % recommended dose of fertilizer recorded higher yield and yield components like productive tiller, more number of panicles, higher panicle length, higher panicle weight, total number of grains per panicle and higher thousand grain weight.

REFERENCES


