Performance of summer pearl millet (*Pennisetum glaucum* L.) based intercropping with legume crops in different row ratios under middle Gujarat conditions

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**Abstract**: The field experiment was conducted in summer, 2010 on loamy sand soil at Anand to study the comparative performance of different pearl millet based intercropping systems. Results revealed that pearl millet sole produced higher grain and straw yields of pearl millet, but intercropping of pearl millet + green gram at 1:2 row ratio recorded higher pearl millet equivalent yield, net return and benefit:cost ratio and it was found superior than sole pearl millet and intercropping of pearl millet with greengram, mothbean or cluster bean in different row ratios.

**Key Words**: Pearl millet, Row ratios, Legume


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**INTRODUCTION**

Pearl millet (*Pennisetum glaucum* (L.) R. Br. Emend, Stuntz) is the fourth most important food grain crop in India after rice, wheat, and sorghum. As an traditional arid and semi arid crop, it is an important component of dry land agriculture. Summer pearl millet is popular in Gujarat State with higher yield and excellent grain quality. In Gujarat, summer pearl millet occupied 3.82 lakh hectares area with an annual production of 9.41 lakh tones and productivity of 2459 kg per hectare (Anonymous, 2011).

The main principles involved in selecting intercrops are that they should not be competitive with the main crop for soil moisture, nutrients and sunlight. Considerable work has been done in selecting suitable crops and legumes like green gram, moth bean and cluster bean were found suitable for intercropping in Pearl millet. Patel and Kalyanasundaram (1988) also showed that this legume crops are more stable in their grain yields in arid region.

**MATERIAL AND METHODS**

The field experiment was conducted during summer season of the year 2010 at College Agronomy Farm, Anand Agricultural University, Anand with ten treatments viz.: \(T_1\) : Pearl millet sole, \(T_2\) : Pearl millet + green gram (1:1), \(T_3\) : Pearl millet + green gram (1:2), \(T_4\) : Pearl millet + green gram (2:1), \(T_5\) : Pearl millet + moth bean (1:1), \(T_6\) : Pearl millet + moth bean (1:2), \(T_7\) : Pearl millet + moth bean (2:1), \(T_8\) : Pearl millet + cluster bean (1:1), \(T_9\) : Pearl millet + cluster bean (1:2), \(T_{10}\) : Pearl millet + cluster bean (2:1) and laid out in Randomized Block Design with four replications. The green gram variety Meha, moth bean variety RMO-225 and cluster bean variety Gujarat Guar-1 were sown in line at 45 cm between rows of main crop pearl millet (variety GHB-558) as an intercrop as per treatments on February 17th, 2010-11.

The soil of the experimental field was loamy sand in texture, low in available nitrogen, medium in available phosphorus and high in available potassium. The fertilizers were given on the area basis to each crop as per recommendation. Full dose of P\(_2\)O\(_5\) and half dose of N in pearl millet were applied as basal dose, while the remaining half N was top dressed at 30 DAS. Irrigations were given as per requirement of the crops.

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RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

Growth and yield attributes:
The results revealed that plant height at harvest, ear head length and 1000-grain weight of pearl millet were not affected significantly by sole crop and intercropping systems (Table 1). However, maximum plant height of pearl millet was noticed under sole pearl millet while, the highest earhead length and 1000-grain weight of pearl millet were recorded under intercropping system of pearl millet + green gram at 1:2 row ratio (Table 1). Likewise, all the three intercrops grown under 1:2 row ratio recorded higher values of 1000-grain weight of green gram, moth bean and cluster bean than intercrops grown at 1:1 and 2:1 row ratios (Table 1). Higher number of effective tillers per plant and total tillers per plant of pearl millet were obtained when it was sown with green gram, moth bean and cluster bean at 1:2 row ratio and they were significantly superior than pearl millet sole. The pearl millet sole crop recorded the lowest number of total tillers and effective tillers per plant. Choudhary (2009) also observed that significantly higher number of effective tillers per plant was obtained under pearl millet crop sown with green gram.

The harvest index of pearl millet and intercropping systems was not affected much by different treatments (Table 2). All the intercropping systems recorded higher values of LER (more than 1.00) than sole pearl millet, which indicated greater biological efficiency of the systems (Table 2). The highest LER (1.24) was noticed under treatment T<sub>3</sub>, i.e. Pearl millet + cluster bean at 1:2 ratio. The relative crowding co-efficient (RCC) of pearl millet and aggressivity were found higher when pearl millet was intercropped with cluster bean at 1:2 row ratio (Table 2).

Yield and quality:
Significantly the highest grain (3535 kg ha<sup>-1</sup>) and stover (7724 kg ha<sup>-1</sup>) yields of pearl millet were recorded when it was grown as sole crop as compared to pearl millet grown with all the intercrops at 1:1, 1:2 and 2:1 row ratios (Table 3). This was might be due to higher competition offered by intercrops to pearl millet for natural resources like space, plant nutrients, moisture and incoming solar radiation. The results corroborate with the findings of Kumar et al. (2006).

The higher seed and stover yields of intercrops were recorded in 1:2 row ratio as compared to 1:1 and 2:1 row ratios. This was due to higher plant stand of intercrops under 1:2 row ratio. Significantly the highest pearl millet equivalent yield (6632 kg ha<sup>-1</sup>) was recorded with treatment T<sub>3</sub> (pearl millet + green gram in 1:2 row ratio), which was 53 % higher than sole pearl millet and it was significantly superior than all the other treatments. Pearl millet sole recorded the lowest pearl millet equivalent yield (4307 kg ha<sup>-1</sup>). The findings are in conformity with those reported by Baldevram et al. (2005), Kumar et al. (2006) and Choudhary (2009). Among the different treatments, the highest net return (43380 Rs. ha<sup>-1</sup>) as well as benefit:cost ratio (1.81) were obtained when pearl millet crop was intercropped with green gram at 1:2 row ratio.

The highest protein content (10.32%) was observed in the treatment T<sub>3</sub> (pearl millet + green gram at 1:2 ratio) and all the intercropping systems exerted their effect on protein content of pearl millet grains as they were significantly superior than sole pearl millet crop (Table 1).

### Table 1: Effect of different treatments on plant growth, yield attributes and grain protein content

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Treatments</th>
<th>Plant height at harvest(cm)</th>
<th>Earhead length (cm)</th>
<th>No. of total tillers per plant</th>
<th>No. of effective tillers per plant</th>
<th>1000-grain weight (g)</th>
<th>Grain protein content(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Pearl millet sole</td>
<td>190.00</td>
<td>--</td>
<td>22.00</td>
<td>6.74</td>
<td>2.35</td>
<td>7.10</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Pearl millet + Green gram (1:1)</td>
<td>186.00</td>
<td>51.97</td>
<td>22.50</td>
<td>7.56</td>
<td>2.90</td>
<td>7.22</td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>Pearl millet + Green gram (1:2)</td>
<td>180.75</td>
<td>48.45</td>
<td>25.80</td>
<td>7.97</td>
<td>3.40</td>
<td>7.32</td>
</tr>
<tr>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>Pearl millet + Green gram (2:1)</td>
<td>182.75</td>
<td>47.34</td>
<td>21.80</td>
<td>7.39</td>
<td>3.10</td>
<td>7.25</td>
</tr>
<tr>
<td>T&lt;sub&gt;5&lt;/sub&gt;</td>
<td>Pearl millet + Moth bean (1:1)</td>
<td>184.00</td>
<td>27.56</td>
<td>22.30</td>
<td>7.50</td>
<td>2.65</td>
<td>7.15</td>
</tr>
<tr>
<td>T&lt;sub&gt;6&lt;/sub&gt;</td>
<td>Pearl millet + Moth bean (1:2)</td>
<td>180.25</td>
<td>25.45</td>
<td>24.90</td>
<td>7.83</td>
<td>3.25</td>
<td>7.27</td>
</tr>
<tr>
<td>T&lt;sub&gt;7&lt;/sub&gt;</td>
<td>Pearl millet + Moth bean (2:1)</td>
<td>182.00</td>
<td>24.67</td>
<td>24.10</td>
<td>7.09</td>
<td>3.08</td>
<td>7.18</td>
</tr>
<tr>
<td>T&lt;sub&gt;8&lt;/sub&gt;</td>
<td>Pearl millet + Cluster bean (1:1)</td>
<td>184.50</td>
<td>149.34</td>
<td>23.00</td>
<td>7.61</td>
<td>2.95</td>
<td>7.21</td>
</tr>
<tr>
<td>T&lt;sub&gt;9&lt;/sub&gt;</td>
<td>Pearl millet + Cluster bean (1:2)</td>
<td>180.50</td>
<td>147.26</td>
<td>26.00</td>
<td>7.92</td>
<td>3.38</td>
<td>7.29</td>
</tr>
<tr>
<td>T&lt;sub&gt;10&lt;/sub&gt;</td>
<td>Pearl millet + Cluster bean (2:1)</td>
<td>182.50</td>
<td>146.12</td>
<td>22.50</td>
<td>7.29</td>
<td>3.15</td>
<td>7.24</td>
</tr>
</tbody>
</table>

S.E.= 5.55
C.D. (P=0.05) = NS

PM= Pearl millet , IC=Intercrop, NS=Non-significant
Thus, it can be concluded that pearl millet sole produced higher grain and straw yields of pearl millet, but intercropping system of pearl millet + green gram at 1:2 row ratio was found superior than other intercropping treatments and gave higher pearl millet equivalent yield as well as higher net return and benefit : cost ratio than sole pearl millet during summer season under middle Gujarat conditions.

REFERENCES


