EFFECT OF VARYING SOWING DATE AND ROW SPACINGS ON YIELD
ATTRIBUTES AND YIELDS OF RABI GRAIN AMARANTH
(AMARANTHUS HYPOCHONDRIACUS L.) UNDER
SOUTH GUJARAT CONDITIONS*

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ABSTRACT
A field experiment was conducted during winter season of 2005-06 on grain Amaranth
(Amaranthus hypochondriacus L.) var. GA-1 to study the response of varying sowing date
and row spacings. Among four sowing dates, 1st November was found markedly superior
than 15th November, 1st December and 15th December in respect to seed yield and yield
attributes viz. Length of Spike, Length of Spikelets and 1,000 Seed Weight along with
Benefit: Cost ratio. Whereas, 30 cm row spacing recorded significantly highest seed
yield and Benefit: Cost ratio followed by 45 cm row spacing and lowest was associated
with 60 cm row spacing, but reverse trend was observed regarding Length of Spike
and Spikelets both.

Key words : Grain amaranth, Amaranthus hypochondriacus L., Sowing dates.

In Gujarat, amaranth is either grown on
borders of the field of Lucerne/Cumin or taken as
a mixed crop with mustard. It is also taken as a
sole crop in Banaskantha district. The amaranth
grain has been considered sacred food and grains
are used in several ways as Confectionary
preparation as well as used as green leaf
vegetable. So that amaranath has industrial value
in conjunction with medicinal importance.
Besides, amaranth also possesses a more efficient
C₄ metabolic pathway. Though the average
productivity of improved varieties of grain
amaranths has been attained up to 1.5 t ha⁻¹ both
in hills and plains (Srivastava, 2004), but the
productivity of this crop is low owing to meagre
scientific information regarding its cultivation
practices. Among the crop management factors,
time of sowing and spacing play a vital role in
increasing the amaranth yield. Keeping facts in
view as highlighted above, an experiment entitled
“Effect of varying sowing date and row spacings
on yield attributes and yields of rabi grain
Amaranth (Amaranthus hypochondriacus L.)
under South Gujarat conditions” was therefore,
undertaken to assess the response of experimental
variables.

This trial was carried out during winter
season of 2005-06 on Amaranth var. GA-1 at the
research farm of the Navsari Agricultural
University, Navsari, Gujarat, India. The soil of
the experimental field was classified under the
group of Ustorthents that is deep black soils with
slightly alkaline in reaction (pH 7.58). It was low
in organic carbon (0.43%) alongwith low in
available nitrogen (237.60 kg ha⁻¹), medium in
available P₂O₅ (31.28 kg ha⁻¹) and high in

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available K$_2$O (345 kg ha$^{-1}$). The experiment was laid out in split plot design comprising four varying treatments of sowing dates in main plots (1$^{st}$ November, 15$^{th}$ November, 1$^{st}$ December and 15$^{th}$ December), then each main plot was divided in sub-plots to assign three row spacings in cm (30, 45 and 60). Accordingly, 12 treatment combinations were formed and replicated thrice. Half of N (12.5 kg ha$^{-1}$) and full of P$_2$O$_5$ (12.5 kg ha$^{-1}$) of the recommended fertilizer dose was applied as basal. Rest N was top-dressed after 30 days of sowing. The crop was sown @ 2 kg seed ha$^{-1}$ at the depth of 1-2 cm depth and desired plant population was maintained by thinning of extra plants at 15 days after sowing.

As evident in Table 1, length of spike and spikelets as well as 1000 seeds weight were observed significantly maximum in early sown crop (1$^{st}$ November) though the lowest magnitude of aforesaid yield attributes were recorded in late sown crop (15$^{th}$ December). This might be due to favourable and longer reproductive growth phase. The results indicated that the crop sown on 1$^{st}$ November recorded significantly higher seed and stover yields presented in kg ha$^{-1}$, which were 31.76 and 16.24 per cent higher than 15$^{th}$ December. The highest seed and stover yields were observed in 1$^{st}$ November sowing. It may have been due to better growth and yield attributes. Thereby, 1$^{st}$ November sowing of amaranth produced maximum B:C ratio (2.61) and proved most remunerative.

In yield attributing characters, length of spike and spikelets only touched the level significance due to variation in row spacing (Table 1). Sowing of crop at wider row spacing of 60 cm produced significantly at per with the 45 cm row spacing. This might be due to lesser inter-row competition for space, nutrients and moisture in wider row spacing than narrow. Unlikely, the seed and stover yields of grain Amaranth per unit area were found significantly higher at 30 cm spacing and minimum was associated with wider row spacing i.e. 60 cm. This might be attributed to substantially low plant population was obtained at wider row spacing that was not optimum for yield maximization. Economically, 30 cm row spacing was found most viable and it recorded highest gross return (Rs. ha$^{-1}$), net return (Rs. ha$^{-1}$) and B:C ratio (2.53) along with cost of cultivation (Rs. ha$^{-1}$). The interaction effect between sowing date and row spacing was found statistically non-significant.

### Table 1. Effect of experimental variables on yield attributes, yields and B:C ratio of Grain Amaranth (*Amaranthus hypochondriacus* L.)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Length of spike (cm)</th>
<th>Length of spikelets (cm)</th>
<th>1000-seed weight (g)</th>
<th>Seed yield (kg ha$^{-1}$)</th>
<th>Stover yield (kg ha$^{-1}$)</th>
<th>Cost of Cultivation (Rs. ha$^{-1}$)</th>
<th>Gross Return (Rs. ha$^{-1}$)</th>
<th>Net Return (Rs. ha$^{-1}$)</th>
<th>Benefit: Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sowing dates</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1$^{st}$ November</td>
<td>44.6</td>
<td>11.1</td>
<td>0.60</td>
<td>1232</td>
<td>2161</td>
<td>5166</td>
<td>18694</td>
<td>13528</td>
<td>2.61</td>
</tr>
<tr>
<td>15$^{th}$ November</td>
<td>39.4</td>
<td>8.8</td>
<td>0.56</td>
<td>1171</td>
<td>2095</td>
<td>5166</td>
<td>17774</td>
<td>12608</td>
<td>2.44</td>
</tr>
<tr>
<td>1$^{st}$ December</td>
<td>34.7</td>
<td>8.1</td>
<td>0.54</td>
<td>1059</td>
<td>2034</td>
<td>5166</td>
<td>16089</td>
<td>10924</td>
<td>2.11</td>
</tr>
<tr>
<td>15$^{th}$ December</td>
<td>32.7</td>
<td>8.1</td>
<td>0.49</td>
<td>935</td>
<td>1859</td>
<td>5166</td>
<td>14214</td>
<td>9048</td>
<td>1.75</td>
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<tr>
<td>SEm±</td>
<td>1.38</td>
<td>0.44</td>
<td>0.01</td>
<td>34</td>
<td>32</td>
<td></td>
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<tr>
<td>C.D. (P=0.05)</td>
<td>4.80</td>
<td>1.56</td>
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</table>

<table>
<thead>
<tr>
<th>Row spacing (in cm)</th>
<th>Length of spike (cm)</th>
<th>Length of spikelets (cm)</th>
<th>1000-seed weight (g)</th>
<th>Seed yield (kg ha$^{-1}$)</th>
<th>Stover yield (kg ha$^{-1}$)</th>
<th>Cost of Cultivation (Rs. ha$^{-1}$)</th>
<th>Gross Return (Rs. ha$^{-1}$)</th>
<th>Net Return (Rs. ha$^{-1}$)</th>
<th>Benefit: Cost Ratio</th>
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<tr>
<td>30</td>
<td>33.6</td>
<td>7.8</td>
<td>0.56</td>
<td>1202</td>
<td>2126</td>
<td>5166</td>
<td>18248</td>
<td>13082</td>
<td>2.53</td>
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<tr>
<td>45</td>
<td>39.4</td>
<td>8.9</td>
<td>0.55</td>
<td>1099</td>
<td>2038</td>
<td>5125</td>
<td>16687</td>
<td>11521</td>
<td>2.23</td>
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<tr>
<td>60</td>
<td>40.5</td>
<td>10.3</td>
<td>0.54</td>
<td>997</td>
<td>1947</td>
<td>5105</td>
<td>15143</td>
<td>9977</td>
<td>1.93</td>
</tr>
<tr>
<td>SEm±</td>
<td>1.88</td>
<td>0.51</td>
<td>0.01</td>
<td>31</td>
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For getting higher production and economical return from grain amaranth cv. GA-1 under South Gujarat conditions, the crop should be sown on 1st November with row spacing of 30 cm.

REFERENCES