GROWTH AND YIELD OF OKRA (ABELMOSCHUS ESCULENTUS) AS INFLUENCED BY SEED WEIGHT

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INTRODUCTION
Okra (Abelmoschus esculentus L.) is an economically important vegetable crop grown in tropical and sub-tropical parts of the world (Arapitsas, 2008, Saifullah and Rabbani 2009). India ranks first in the world with 4.8 million tonnes (67% of the total world production) of okra produced from over 0.45 million ha land (FAOSTAT, 2009). Every part of okra plant have equal importance and used as food, feed and fiber. Its green fruits are also good source of carbohydrate, protein, fats, vitamins and minerals (Owolarafe et al., 2004; Ali et al., 2005; Gopalan et al., 2005; Arapitsas, 2008; Dilruba et al., 2009; Fajinni and Fajinni, 2010) and plays a vital role in human diet (Kahlon et al., 2007; Saifullah et al., 2009).

Seeds of many horticultural crops have been distinguished by size, weight, density, and color (Smith et al., 1973; Smith and Camper, 1975; Smittle et al., 1976; Brandenburg, 1977; Smittle, 1982). Separation by seed weight and/or density, as well as seed size, offers a means of improving seedling vigor and/or yield for many crops (Hartwig and Edwards, 1970; Johnson and Ludders, 1974; Smittle, 1982). Seed weight is one of the most prominent features whose plays an important role in the establishment of the juvenile phase of the life cycle (Tripathi and Khan, 1990; Khan and Uma Shankar, 2001), principally under conditions where resources are scarce (Grubb and Coomes, 1997; Grubb and Burslem, 1998; Meyer and Carlson, 2001). Seed yield in corn was influenced by different planting density and size of seed as reported by (Arynnia et al., 2011).

There is very little published information on the influence of seed weight/ seed size on growth and performance of okra. Therefore, the present investigation was undertaken to find out the influence of seed weight on seed and seedling quality parameters as well as yield in order to determine the acceptable seed weight for realizing of higher vegetable yield.

MATERIALS AND METHODS
The experiment was carried out in Kharif season 2010 at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, West Bengal. The composite seed of each of four varieties were classified on the basis of individual seed weight and variety. The four varieties taken for the experiments were Shagun (V1), Satshira Bhindi (V2), Arka Anamika (V3) and Parbani Kranti (V4). The experiment was laid out in Factorial Randomised Block Design with two factors (seed weight and variety) and three replications. The total numbers of plots were 48 with 2.25m × 1.5m size of each plot. Seed were soaked 8 hours before sowing. FYM was applied @ 15 tonnes per hac along with NPK@ 50:25:25 kg/ha. A spacing of 45cm x 30cm was maintained between the rows and within the plant respectively.

<table>
<thead>
<tr>
<th>Seed Weight Grade</th>
<th>Symbol</th>
<th>Range (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>W1</td>
<td>40-55</td>
</tr>
<tr>
<td>Medium</td>
<td>W2</td>
<td>56-70</td>
</tr>
<tr>
<td>Heavy</td>
<td>W3</td>
<td>71-85</td>
</tr>
<tr>
<td>Control</td>
<td>W0</td>
<td>Composite seed</td>
</tr>
</tbody>
</table>

*Corresponding author

ABSTRACT
A field experiment was conducted during Kharif seasons in 2010, to evaluate the growth and yield response of okra at varying seed weight and determine the optimal seed weight that will maximise the marketing yield. Four varieties of okra have taken in consideration for this investigation viz. Sagum, Satshira, Arka Anamika, and Parbhani Kranti. The result indicated that in all the four varieties, the lowest seed weight was inferior to other seed weight grades. The light seeds showed significantly lower germination percentage (71.83) than the heavy seeds (80.50). Heavy seed weight recorded maximum root (8.19cm) and shoot length (13.19cm) and minimum of days required for opening of cotyledons leaf (5.08) and first true leaf (9.60). Other growth parameters like plant height and number of leaves at different stages varied significantly between the seed weight grades and varieties. Among the varieties, maximum yield of 10.5t/ha. was obtained from Arka Anamika with heavy seed weight.
The total number of irrigation was three in respective season. Germination percentage was recorded from 100 seeds sown in each plot with three replications. Speed of germination was calculated using formula \( \text{average seed germinated / day after sowing.} \) Root and shoot length of seedling were recorded after the fifteen DAS by uprooting five randomly selected seedlings per plot. Other seedling quality parameters like cotyledons emergence and expansion true leaf were recorded from five randomly selected seedlings per plot. Fruits were harvested after 5-6 days from flowering in almost every alternated day. Vegetable yield per hectare was computed by multiplying fruit yield per plant to total number of plants per hectare.

**RESULTS AND DISCUSSION**

Among the different seed weight grades heavy, medium and composite seeds (control) showed statically similar germination percentage (71.83) than the heavy seeds which recorded a maximum germination percentage of 80.50. This might be due to the reason that light seeds failed to emerge from the soil due to the low vigour. The percentage of 80.50. This might be due to the reason that light seeds which recorded a maximum germination percentage (71.83) and heavy seeds of Arka Anamika recorded maximum speed of germination. Maximum root length (8.19) was recorded from heavy seeds which was statistically at par with medium seeds but significantly higher than control and light seeds.

The result is in conformity with the findings of Ali-Karaki (1998). The Maximum shoot length (13.19) was obtained from heavy seeds which produced significantly taller seedlings than other three grades. Light seeds recorded minimum root length (6.85cm) and shoot length (11.27cm). The reason might be higher food reserve in heavier seeds.

Among the varieties Arka Anamika showed significantly higher root length (8.83cm) and shoot length (13.03cm) than the other varieties. Interaction effect was found to be significant and the heavy seeds of Arka Anamika exhibited maximum root length and shoot length (9.76cm and 14.43cm respectively). Similar findings were reported by Cookson et al. (2001); Nerson (2002); Seyed Saeed Hojat (2011).

The effect of seed weight on number of days taken for opening of cotyledons leaf was found to be statistically significant (Table 1).

**Table 1: Growth characters as influenced by seed weight**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Germination percentage</th>
<th>Speed of emergence</th>
<th>Root Length</th>
<th>Shoot Length</th>
<th>Days*</th>
<th>Days**</th>
<th>Plant Height</th>
<th>Number of leaves</th>
<th>Stem Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.Em(±)</td>
<td>1.937</td>
<td>0.168</td>
<td>0.232</td>
<td>0.237</td>
<td>0.118</td>
<td>0.368</td>
<td>0.496</td>
<td>0.266</td>
<td>0.154</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>5.593</td>
<td>0.485</td>
<td>0.669</td>
<td>0.684</td>
<td>0.340</td>
<td>1.062</td>
<td>1.432</td>
<td>0.768</td>
<td>0.466</td>
</tr>
</tbody>
</table>

**Table 2: Yield and yield attributing characters as influenced by seed weight**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Days to first flower</th>
<th>Fruit Length (cm)</th>
<th>Fruit diameter (cm)</th>
<th>Fruit weight (g)</th>
<th>Number of fruits /plant</th>
<th>Fruit yield / plant (g)</th>
<th>Fruit yield / hectare (Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sathishra bhindi</td>
<td>49.467</td>
<td>10.982</td>
<td>1.715</td>
<td>13.483</td>
<td>10.050</td>
<td>122.783</td>
<td>7.281</td>
</tr>
<tr>
<td>Arka Anamika</td>
<td>46.150</td>
<td>13.122</td>
<td>1.573</td>
<td>17.582</td>
<td>13.417</td>
<td>177.533</td>
<td>10.521</td>
</tr>
<tr>
<td>Parvani Kranti</td>
<td>47.950</td>
<td>14.717</td>
<td>1.571</td>
<td>16.448</td>
<td>11.967</td>
<td>148.033</td>
<td>8.772</td>
</tr>
<tr>
<td>S.Em(±)</td>
<td>0.457</td>
<td>0.123</td>
<td>0.038</td>
<td>0.087</td>
<td>0.254</td>
<td>2.272</td>
<td>0.134</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>1.319</td>
<td>0.356</td>
<td>0.109</td>
<td>0.358</td>
<td>0.733</td>
<td>6.561</td>
<td>0.388</td>
</tr>
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<th>Fruit yield / hectare (Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>49.967</td>
<td>12.992</td>
<td>1.637</td>
<td>16.442</td>
<td>11.967</td>
<td>148.533</td>
<td>8.802</td>
</tr>
<tr>
<td>W0</td>
<td>47.900</td>
<td>12.973</td>
<td>1.635</td>
<td>16.630</td>
<td>12.467</td>
<td>165.00</td>
<td>9.218</td>
</tr>
<tr>
<td>S.Em(±)</td>
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1). Minimum number of days (5.083) was noticed in the heavy seeds and with the decrease in seed weight; number of days was increased signifying at faster rate of growth in plants from heavier seeds. Light seed weight grade required more number of days for opening of cotyledons leaf i.e. 6.408.

The height of the plant was also significantly influenced by different seed weight grades. Heavy seed weight produced taller plants (40.73cm) than that of medium seeds (40.04cm) and control (37.23cm). The observation on plant height correlated with seed size was in agreement with the findings of Figueiredo et al. (1970); Anonymous (1998); M.S. Hossain et al. (2011). There was a significant difference among the different varieties in case of stem diameter (Table 1). Parvani Kranti exhibited maximum value of 10.117mm. Similarly there was significant variation in number of leaves among the varieties and seed weight. The maximum number of leaves 32.517 was obtained from heavy seed weight. The similar result was also observed by Pahathizwe et al. (2011). It revealed from the experiment that seed weight significantly influenced the number of days taken to produce first flower. Minimum days of (44.983) were recorded with heavy seed followed by medium, composite, and light seed weight grade. The length of fruit produced by different seed weight grades was statistically similar but there was significant variation in fruit length among the varieties. Maximum fruit length (14.717cm) was recorded in Parbhani Kranti. Variations in fruit diameter due to the influence of seed weight was not significant, but the maximum value (1.652cm) was obtained with heavy seeds. There was significant variation in fruit diameter among the varieties. Variety seven dhari showed maximum fruit diameter (1.715cm) which was at par with that of Shagun. The fruit diameter weight was obtained from heavy seed weight (Table 2). Among the varieties Arka Anamika produced maximum fruit diameter. There was an increasing trend in number of fruits with the increase in seed weight. Dawande et al. (1993) also reported the similar results for number of maximum fruits in soybean with large seed weight. Maximum number of fruits was produced from variety Shagun followed by Arka Anamika. Heavy seeds showed the maximum fruit yield (9.52t/ha) than the other seed weight grades. Similarly, higher vegetable yield from bolder seeds have been reported by Pearson and Miklas Heather and Siciota (1991) in broccoli, Singh et al. (1993) found maximum yield with heavy seed (tuber) weight of potato, Sokolowska et al. (1995) in carrot Kartaprudja (1998) in tomato and. Roy et al. (1996) and Upadhyya et al. (2001) suggested that seed size and their density strongly correlated with yield.

It is however, suggested to eliminate light seed weight seeds from the seed lot for improving seed quality as well as vegetable yield.

REFERENCES


Tripathi, R. S. and Khan, M. L. 1990. Effects of seed weight and microsite characteristics on germination and seedling fitness in two species of Quercus in a subtropical wet hill forest. Oikos. 57: 289-296.


