Effect of organic seed pelleting on biometric, biophysical and yield parameters of clusterbean under saline condition

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ABSTRACT
Cluster bean is one of the major legumes cultivated in many parts of the world. However effect of organic seed pelleting in this crops needs more attention nowadays in probem soils like saline soil. Field experiments were carried out with cluster bean cv. Pusa Mausami to study the effect of organic seed pelleting on biometric, biophysical and yield parameters of clusterbean under saline condition. The seeds of cluster bean cv. Pusa Mausami were pelleted with pungam, prosopis, notchi, arappu leaf powders @ 50, 100, 150 and 200 g per kg. From the results, it was found that seed pelleting with pungam leaf powder @ 200 g per kg registered significantly higher values for biometric parameters viz., plant height, number of branches per plant, dry matter production, biophysical parameters viz., photosynthetic rate, transpiration rate, stomatal conductance, intercellular CO₂ concentration and yield parameters viz., pod length, number of pods per plant, pod yield per plant, number of seeds per pod, seed yield per plant and hundred seed weight. From the present study, it was concluded that seed pelleting with pungamn leaf powder @ 200 g per kg can be recommended for increased growth and yield parameters in cluster bean under saline conditions.

Key words: Cluster bean, Pungam, Seed pelleting, Yield.

INTRODUCTION
Cluster bean (Cyamopsis tetragonoloba (L.) Taub.) popularly known by its vernacular name “Guar” is an important legume crop mainly grown under rainfed conditions of arid and semi arid regions of tropical India during kharif season. It is drought hardy, deep rooted and can be grown for different purposes viz., vegetable, green fodder, green manuring, production of seed and for endospermic gum (30-35 per cent). The primary centre of origin of guar is India (Vavilov, 1951). The tender pods of cluster bean are nutritionally rich in energy (16 Kcal), moisture (81 g), protein (3.2 g), fat (1.4 g), carbohydrate (10.8 g), vitamin A (65.31 IU), vitamin C (49 mg),calcium (57 mg) and iron (4.5 mg) per 100 g of edible portion (Kumar and Singh, 2002).

Seed pelleting is the process of enclosing a seed with small quantity of inert material to facilitate precision planting. The inherent material may create natural water holding media and also provides small amount of nutrients to young seedlings. It also reduces the problem of thinning, gap filling and chemicals required in low quantity. In seed pelleting, seeds are covered with either nutrients (organic or inorganic in nature) or pest or pathogen controlling agents which will provide an opportunity to package effective quantities of nutrients so that they can influence the seed or soil at the soil rhizosphere. The cost involved in seed pelleting is also less but the benefit to the farmers especially who depends on monsoon showers is more.

Since, the indiscriminate usage of inorganic chemicals and fertilizers lead to environmental pollution, it becomes essential to promote organic farming. In this study, botanical leaf powders are used for seed pelleting. Further to study the performance of the crop under moderate saline condition, the experiment was conducted in induced saline condition in the laboratory and under natural saline conditions in the field. The present investigation was therefore, undertaken with the objective to study the effect of organic seed pelleting on growth and yield of cluster bean under natural saline condition.

MATERIALS AND METHODS
The fresh leaves of Pungam (Pongamia pinnata), Prosopis (Prosopis juliflora) and Nochi (Vitex nigundo) and Arappu (Albizia amara) were collected separately and sundried. The dried leaves were powdered using pestle and mortar. A fine leaf powder was obtained by sieving through 0.10 mm wire mesh. The seed pelleting materials were mixed in definite proportion to get different combinations as per the treatments and to get sufficient quantity of pelleting mixture to pellet known quantity of seed.

The required quantities of seeds were smeared with gum arabic as adhesive. The mixture of pelleting materials

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was taken in a glass container, gum smeared seeds were added and then container was rotated acentrically so that pelleting mixture was coated on to the seed uniformly in required proportion and the pelleted seeds were air dried before use. Seeds were pelleted with leaf powders of pungam, prosopis, nochi, arappu @ 50, 100, 150 and 200 g kg⁻¹ of seed and a total of 16 treatments along with a control was taken for this study. The 17 treatments involving four pelleting sources viz. pungam, prosopis, nochi and arappu leaf powder @ 50g / kg, 100g / kg, 150g / kg & 200g / kg of seed guar were tested and compared with absolute control.

The field trial was conducted during kharif season (June-August) 2017 by adopting randomized block design (RBD) with three replications under natural saline condition (pH 7.4: EC 3.9). Recommended agronomic practices and need based plant protection measures were adopted.

For recording biometric parameters, ten plants were randomly selected in each plot and the observations were recorded.

The height of plant from ground level to the tip of the plant was measured using a meter scale and the mean value expressed in centimeter. Total number of branches per plant was counted and the mean number of branches per plant was recorded as whole number. Ten seedlings were selected at random separately and were uprooted with root system intact and were washed to remove the soil particles and placed in a paper cover and dried under shade for 24 h and then in the hot air oven maintained at 100°C for 24 h. The dried plants were cooled in desiccators for 30 minutes and the mean weight was recorded in grams.

Table 1: Effect of organic seed pelleting on growth parameters of cluster bean cv. Pusa Mausami under saline conditions.

<table>
<thead>
<tr>
<th>Treatment (T)</th>
<th>Plant height (cm)</th>
<th>Number of branches plant⁻¹</th>
<th>Dry matter production (g seedlings⁻¹)</th>
<th>Days to 1st flowering</th>
<th>Days to 50% flowering</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀ Control</td>
<td>69.50</td>
<td>5.00</td>
<td>19.15</td>
<td>28.58</td>
<td>32.40</td>
</tr>
<tr>
<td>T₁ Pungam @ 50g</td>
<td>71.70</td>
<td>5.30</td>
<td>22.94</td>
<td>27.64</td>
<td>31.00</td>
</tr>
<tr>
<td>T₂ Pungam @100g</td>
<td>73.00</td>
<td>5.40</td>
<td>23.58</td>
<td>27.41</td>
<td>30.50</td>
</tr>
<tr>
<td>T₃ Pungam @150g</td>
<td>75.22</td>
<td>5.60</td>
<td>26.55</td>
<td>27.01</td>
<td>29.50</td>
</tr>
<tr>
<td>T₄ Pungam @200g</td>
<td>76.00</td>
<td>5.80</td>
<td>27.41</td>
<td>26.50</td>
<td>28.10</td>
</tr>
<tr>
<td>T₅ Prosopis @50g</td>
<td>70.00</td>
<td>5.30</td>
<td>23.00</td>
<td>27.62</td>
<td>31.30</td>
</tr>
<tr>
<td>T₆ Prosopis @100g</td>
<td>72.00</td>
<td>5.35</td>
<td>23.50</td>
<td>27.55</td>
<td>30.95</td>
</tr>
<tr>
<td>T₇ Prosopis @150g</td>
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<td>5.80</td>
<td>24.33</td>
<td>27.30</td>
<td>30.15</td>
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<tr>
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<td>6.15</td>
<td>25.65</td>
<td>27.11</td>
<td>29.50</td>
</tr>
<tr>
<td>T₉ Nochi @ 50g</td>
<td>71.00</td>
<td>5.21</td>
<td>22.75</td>
<td>27.62</td>
<td>30.30</td>
</tr>
<tr>
<td>T₁₀ Nochi @ 100g</td>
<td>71.50</td>
<td>5.45</td>
<td>23.00</td>
<td>27.40</td>
<td>30.00</td>
</tr>
<tr>
<td>T₁₁ Nochi @ 150g</td>
<td>73.33</td>
<td>6.00</td>
<td>25.00</td>
<td>27.25</td>
<td>29.40</td>
</tr>
<tr>
<td>T₁₂ Nochi @ 200g</td>
<td>74.10</td>
<td>6.25</td>
<td>26.15</td>
<td>27.10</td>
<td>28.18</td>
</tr>
<tr>
<td>T₁₃ Arappu @ 50g</td>
<td>71.40</td>
<td>5.25</td>
<td>23.15</td>
<td>27.62</td>
<td>29.40</td>
</tr>
<tr>
<td>T₁₄ Arappu @ 100g</td>
<td>72.00</td>
<td>5.30</td>
<td>24.00</td>
<td>27.58</td>
<td>29.00</td>
</tr>
<tr>
<td>T₁₅ Arappu @ 150g</td>
<td>72.70</td>
<td>5.45</td>
<td>25.00</td>
<td>27.38</td>
<td>28.45</td>
</tr>
<tr>
<td>T₁₆ Arappu @ 200g</td>
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<td>5.65</td>
<td>25.15</td>
<td>27.12</td>
<td>28.25</td>
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<tr>
<td>General mean</td>
<td>72.58</td>
<td>5.54</td>
<td>24.14</td>
<td>27.40</td>
<td>29.79</td>
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<tr>
<td>SEd</td>
<td>0.43</td>
<td>0.27</td>
<td>0.59</td>
<td>0.69</td>
<td>0.79</td>
</tr>
<tr>
<td>CD (P=0.05)</td>
<td>0.86</td>
<td>0.54</td>
<td>1.18</td>
<td>1.38</td>
<td>1.58</td>
</tr>
</tbody>
</table>

The number of pods per plant was counted and the mean value was calculated and expressed as whole number. At maturity, five pods obtained in each of the plants were measured for their length using scale. Excluding the stalk, the length was measured from the base to the tip of the pod and the mean pod length was expressed in centimeter. The pods used for recording pod length were split longitudinally and the number of seeds in each pod was counted. Mean number of seeds per pod was calculated and was reported as whole number. Three replicates of 100 seeds were drawn from each treatment randomly and weighed in an electronic balance and the mean weight was expressed in grams (ISTA, 1999). The pod yield plant⁻¹ at maturity was weighed by using an electronic balance in randomly selected plants and the mean pod yield plant⁻¹ was arrived at and expressed in grams. The pods from ten tagged plants in each treatment were hand shelled. The seeds were cleaned and weighed in an electronic balance and the mean weight was expressed in grams.

Leaf photosynthetic rate, transpiration rate, stomatal conductance and intercellular CO₂ concentration were measured from two, uppermost fully expand leaves on intact plants in the field using LICOR-6400xt Portable Photosynthetic System (Lioncolin, USA). All these estimations and measurements were made between 10.00-11.00 A.M on three replicates from each treatment. The chlorophyll content was estimated as per the procedure of Yoshida et al. (1971).

RESULTS AND DISCUSSION

Biometric parameters: Among the treatments, (Table 1) it was found that pungam leaf powder pelleted seeds @ 200 g
per kg recorded the higher plant height (76.00 cm) followed by pungam leaf powder pelleted seeds @ 150 per kg (75.22 cm) and notchi leaf powder pelleted seeds @ 200 g per kg (74.10 cm). The lowest mean value (69.50 cm) was observed in control seeds. The highest number of branches were recorded by notchi leaf powder pelleted seeds @ 200 g per kg followed by prosopis leaf powder pelleted seeds @ 200 g per kg and notchi leaf powder pelleted seeds @ 150 g per kg (6.25, 6.15 and 6.00 respectively). The control seeds recorded lowest number of branches (5.00). For dry matter production, pungam leaf powder pelleted seeds @ 200 g per kg registered the highest mean value (27.41 g) followed by pungam leaf powder pelleted seeds @ 150 g per kg (26.55 g) and notchi leaf powder pelleted seeds @ 200 g per kg (26.15 g) whereas the lowest mean value (19.15 g) was recorded by untreated seeds.

Plant height is very important criterion for a crop in providing more places for flower production leading to better pod production. Plant height declined with progressive increase in the salinity. Decline in plant height probably resulted from the decreased availability of soil water and increasing toxicity of Na⁺ and Cl⁻ associated with salinity. In cluster bean, plant height showed significant decrease under salinity (Deepika Gulati and Dhingra, 2014). The prosopis leaf powder contains saponin like substance which acts as a precursor of GA₃ and invigourated the seed at a particular concentration (Nadeem Binzia, 1992). In a similar way, the initial vigour of the pungam leaf powder invigourated seeds might have induced the seedling growth and enabled better nutrient absorption, thus encouraging quick growth and increased plant height with increased number of branches.

For days to first flowering, untreated seeds took more days (28.58 days) followed by pungam leaf powder pelleted seeds @ 50 g per kg (27.64 days). Pungam leaf powder pelleted seeds @ 200 g per kg required only 26.50 days to first flowering. Highest mean values for days to fifty percent flowering were observed in control (32.40 days) followed by prosopis leaf powder pelleted seeds @ 50 g per kg (31.30 days) and pungam leaf powder pelleted seeds @ 50 g per kg (31.00 days). Pungam leaf powder pelleted seeds @ 200 g per kg took only 28.10 days for fifty per cent flowering. Early days to first flowering and 50 percent flowering were observed because of the effect of fast emergence of the seeds at the beginning which was significantly higher and positive. Kamaraj and Padmavathi (2012) reported similar results for growth parameters using 1% prosopis leaf extract treatment. Paddy seeds hardened with KCl 1% followed by pelleting with pungam leaf powder @ 200 g/kg also recorded increased growth and biometric characters (Prakash et al., 2013).

**Gas exchange parameters:** Among the treatments, pungam leaf powder pelleted seeds @ 200 g per kg recorded higher mean value for all the four gas exchange parameters studied viz., photosynthetic rate, transpiration rate, inter cellular CO₂ concentration and stomatal conductance (26.88 mg CO₂ m⁻² s⁻¹, 8.92 mg H₂O m⁻² s⁻¹, 292.21 µ mol mol⁻¹ and 0.94 mol m⁻² s⁻¹ respectively). Lowest mean value was recorded in control for all the gas exchange parameters (20.45 mg CO₂ m⁻² s⁻¹, 5.20 mg H₂O m⁻² s⁻¹, 190.89 µ mol mol⁻¹ and 0.31 mol m⁻² s⁻¹ respectively) (Table 2).

The effect of salinity markedly decreased the growth, transpiration rates (Massai et al., 2004), photosynthetic

### Table 2: Effect of organic seed pelleting on gas exchange parameters of cluster bean cv. Pusa Mausami under saline conditions.

<table>
<thead>
<tr>
<th>Treatment (T)</th>
<th>Pₚ (mg CO₂ m⁻² s⁻¹)</th>
<th>Tr (mg H₂O m⁻² s⁻¹)</th>
<th>C𝑖 (µ mol mol⁻¹)</th>
<th>Cs (mol m⁻² s⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀ - Control</td>
<td>20.45</td>
<td>5.20</td>
<td>190.89</td>
<td>0.31</td>
</tr>
<tr>
<td>T₁ - Pungam @ 50g</td>
<td>23.58</td>
<td>7.36</td>
<td>228.60</td>
<td>0.56</td>
</tr>
<tr>
<td>T₂ - Pungam @ 100g</td>
<td>25.63</td>
<td>8.80</td>
<td>268.52</td>
<td>0.62</td>
</tr>
<tr>
<td>T₃ - Pungam @ 150g</td>
<td>25.68</td>
<td>8.89</td>
<td>273.42</td>
<td>0.71</td>
</tr>
<tr>
<td>T₄ - Pungam @ 200g</td>
<td>26.88</td>
<td>8.92</td>
<td>292.21</td>
<td>0.94</td>
</tr>
<tr>
<td>T₅ - Prosopis @ 50g</td>
<td>25.56</td>
<td>7.28</td>
<td>219.20</td>
<td>0.42</td>
</tr>
<tr>
<td>T₆ - Prosopis @ 100g</td>
<td>25.72</td>
<td>8.71</td>
<td>254.12</td>
<td>0.69</td>
</tr>
<tr>
<td>T₇ - Prosopis @ 150g</td>
<td>25.74</td>
<td>8.78</td>
<td>289.15</td>
<td>0.89</td>
</tr>
<tr>
<td>T₈ - Prosopis @ 200g</td>
<td>25.82</td>
<td>8.85</td>
<td>289.34</td>
<td>0.90</td>
</tr>
<tr>
<td>T₉ - Nochi @ 50g</td>
<td>25.25</td>
<td>5.49</td>
<td>198.27</td>
<td>0.39</td>
</tr>
<tr>
<td>T₁₀ - Nochi @ 100g</td>
<td>25.37</td>
<td>6.18</td>
<td>207.14</td>
<td>0.42</td>
</tr>
<tr>
<td>T₁¹ - Nochi @ 150g</td>
<td>25.52</td>
<td>7.84</td>
<td>224.21</td>
<td>0.48</td>
</tr>
<tr>
<td>T₁² - Nochi @ 200g</td>
<td>25.54</td>
<td>7.90</td>
<td>232.18</td>
<td>0.56</td>
</tr>
<tr>
<td>T₁³ - Arappu @ 50g</td>
<td>25.22</td>
<td>5.45</td>
<td>191.18</td>
<td>0.32</td>
</tr>
<tr>
<td>T₁⁴ - Arappu @ 100g</td>
<td>25.26</td>
<td>6.10</td>
<td>218.22</td>
<td>0.47</td>
</tr>
<tr>
<td>T₁⁵ - Arappu @ 150g</td>
<td>25.39</td>
<td>7.35</td>
<td>228.10</td>
<td>0.56</td>
</tr>
<tr>
<td>T₁⁶ - Arappu @ 200g</td>
<td>25.60</td>
<td>8.84</td>
<td>273.18</td>
<td>0.72</td>
</tr>
<tr>
<td>General mean</td>
<td>25.19</td>
<td>7.52</td>
<td>239.87</td>
<td>0.58</td>
</tr>
<tr>
<td>SEd</td>
<td>0.0301</td>
<td>0.0251</td>
<td>0.2832</td>
<td>0.0222</td>
</tr>
<tr>
<td>CD (P=0.05)</td>
<td>0.0606</td>
<td>0.0504</td>
<td>0.5693</td>
<td>0.0446</td>
</tr>
</tbody>
</table>

Pₚ – Photosynthetic rate, C𝑖 – Intercellular CO₂ concentration, Tᵣ – Transpiration rate, Cs – Stomatal conductance
rates and pigment contents (Miroslava et al., 2014; Stoeva and Kaymakanova, 2007). During salt stress, the concentration of CO₂ in chloroplasts decreased as a result of the reduction in stomata conductance, in spite of the apparent stability of CO₂ concentration in intercellular spaces (Tournex and Peltier, 1995). According to Tezara et al. (2003), both water and saline stress markedly inhibited photosynthetic and stomatal conductance, although the effect of salinity on these variables was milder than water deficit. Stomatal resistance measured at the end of the experimental period showed that, under salinity lentil plants close their stomata which lead to enhanced stomatal resistance (Turan et al., 2007).

Gas exchange parameters viz., photosynthetic rate, transpiration rate, stomatal conductance and intercellular CO₂ concentration were found increased well with pungam leaf powder pelleting @ 200 g kg⁻¹ seeds. Similar observations of increased gas exchange parameters viz., leaf photosynthetic rate, transpiration, stomatal conductance and intercellular CO₂ concentration with flyash treatment was reported by Anbarasan (2011) in cowpea. Similar results of increased gas exchange parameters was already reported by Prakash et al. (2013), Sathiya Narayanan et al. (2016) and Georgin Ophelia (2017).

Chlorophyll content: Higher mean values for chlorophyll a, b and total chlorophyll were recorded by pungam leaf powder pelleted seeds @ 200 g per kg (0.55, 0.60 and 1.15 respectively). Total chlorophyll content were also high in prosopis leaf powder pelleted seeds @ 200 g per kg (1.12) and arappu leaf powder pelleted seeds @ 200 g per kg (1.08). Lowest mean values for chlorophyll a, b and total chlorophyll were recorded (0.35, 0.33 and 0.68 respectively) in control (Fig 1).

The total chlorophyll concentration of cluster bean leaves was reduced in control under saline conditions. Similar results were reported for total leaf chlorophyll concentration in wheat and bean (Turan et al., 2007). The addition of NaCl in the soil decreased chlorophyll concentration in plants (Murat Ali Turan et al., 2009). Total chlorophyll and stomatal resistance of lentil plants were also affected significantly by salinity (Murat Ali Turan et al., 2009). In cluster bean, Chlorophyll fluorescence decreased gradually with increase in salinity (Deepika Gulati and Dhintra, 2014).

Increased chlorophyll ‘a’, ‘b’ and total chlorophyll contents were observed in pungam leaf powder pelleted seeds @ 200 g kg⁻¹. This increase could be also due to the presence of mineral nutrients like nitrogen, potassium and calcium which plays a major role in chlorophyll synthesis (Prakash et al., 2013; Georgin Ophelia, 2017). The invigorative effect of botanical leaf powders would have helped the plants to absorb more nutrients from the soil and utilized for more chlorophyll production resulting in enhanced photosynthetic activity of treated plants (Sathiya Narayanan et al., 2015). Presence of mineral nutrients like nitrogen, potassium and calcium also would have played a major role in chlorophyll synthesis (Prakash et al., 2013). Similarly, increased chlorophyll content with botanicals such as Argemone mexicana, Calotropis procera, Solanum xanthocarpum, and Eichhornia echinulata were also reported by Rose Rizvi et al. (2012).

Yield parameters: Pungam leaf powder pelleted seeds @ 200g per kg produced pods with maximum length (10.61 cm) followed by notchi leaf powder pelleted seeds @ 100 g per kg (10.37 cm) and arappu leaf powder pelleted seeds @ 200g per kg (10.36 cm). Similarly, pungam leaf powder pelleted seeds @ 200g per kg recorded more number of pods per plant (17.89) followed by arappu leaf powder pelleted seeds

<table>
<thead>
<tr>
<th>Treatment (T)</th>
<th>Seeds pod⁻¹(No.)</th>
<th>Hundred seed weight (g)</th>
<th>Seed yield/plant (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀ - Control</td>
<td>8.14</td>
<td>35.55</td>
<td>2.38</td>
</tr>
<tr>
<td>T₁ - Pungam @ 50g</td>
<td>9.22</td>
<td>36.00</td>
<td>2.51</td>
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<tr>
<td>T₂ - Pungam@100g</td>
<td>10.35</td>
<td>36.15</td>
<td>2.58</td>
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<tr>
<td>T₃ - Pungam @150g</td>
<td>11.43</td>
<td>36.52</td>
<td>2.62</td>
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<td>T₄ - Pungam @ 200g</td>
<td>12.67</td>
<td>39.50</td>
<td>2.94</td>
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<tr>
<td>T₅ - Prosopis @50g</td>
<td>9.27</td>
<td>36.15</td>
<td>2.52</td>
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<tr>
<td>CD (P=0.05)</td>
<td>0.8328</td>
<td>1.6422</td>
<td>0.9098</td>
</tr>
</tbody>
</table>
Among the seed pelleting treatments, highest number of seeds per pod (12.67, 12.56 and 12.46 respectively) were recorded by pungam leaf powder pelleted seeds @ 200 g per kg, notchi leaf powder pelleted seeds @ 200 g per kg and arappu leaf powder pelleted seeds @ 200 g per kg respectively. The lowest number of seeds per pod was observed in untreated seeds (8.14). Pungam leaf powder pelleted seeds @ 200 g per kg registered the highest hundred seed weight (39.50 g) followed by notchi leaf powder pelleted seeds @ 200 g per kg (39.43 g) and arappu leaf powder pelleted seeds @ 200 g per kg (39.00 g) (Table 3).

Highest pod yield per plant were recorded by pungam leaf powder pelleted seeds @ 200 g per kg followed by notchi leaf powder pelleted seeds @ 200 g per kg and arappu leaf powder pelleted seeds @ 200 g per kg (10.60 g, 10.40 g and 10.18 g respectively) whereas lowest mean value (7.28 g) was recorded in control seeds. For seed yield per plant, pungam leaf powder pelleted seeds @ 200 g per kg recorded the highest mean value (2.94 g) followed by prosopis leaf powder pelleted seeds @ 150 g per kg (2.89 g) and prosopis leaf powder pelleted seeds @ 200 g per kg (2.84 g).

A plant bio stimulant when applied modified plant growth and yield with positive alteration processes under salt stress condition as reported by Rady et al., (2013). The number of seeds per plant decreased with increasing salinity in cluster bean and nearly one third number of seeds per plant were produced at salinity over the control (Deepika Gulati and Dhingra, 2014). Similar reduction in the number of pods per plant and weight of pods per plant has been reported in mungbean (Ahmed, 2009) and chickpea (Singla and Garg, 2005) culminating in yield reductions.

The leaves of Pongnia pinnata contain 1.16 % nitrogen, 0.14 % phosphorus and 0.49 % potash (Singh, 1982) and various alkaloids like pinnalin, pongamol, Saponin, β-sitosterol and tannins. Saponins present in the pongamia leaf extract might have enhanced the nutrient absorption and also would have protected the seedlings against pathogens (Manisathiya and Muthuchelian, 2010). Higher seed yield in pungam leaf powder pelleted seeds may be due to the increased activity of dehydrogenase, amylase and peroxidase enzymes by the presence of growth regulators like GA3. In the present study also, pungam leaf powder pelleting @ 200 g recorded higher seed yield and other parameters when compared to other treatments and control.

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The increase in yield parameters might be due to the bioactive chemicals present in the pungam leaf powder which triggers the synthesis of gibberellin that improves the germination percentage by quickening the germination process which leads to increase in crop growth and development and improves the yield (Vijaya, 1996). Similar observations with increased yield parameters were reported by Prakash et al. (2013) in rice and Sathiya Narayanan et al. (2014) in bhendi.

The yield parameters viz., number of pods per plant, number of seeds per pod, pod weight, seed yield per plant were found increased when treated with albizzia and pongamia leaf powder. Albizzia leaf powder (15%) recorded higher seed yield per plant than control (Harish Babu et al., 2005).

The pungam leaf powder pelleting treatments might have improved the growth of plant with increased vigour and stronger root system which in turn might have helped in getting more soil moisture and nutrients, thus enabling better...
growth resulting in higher yield (Sai Pradeep Kumar, 2015). Increased yield and yield parameters with flyash seed pelleting has already been reported in black gram (Prakash et al., 2012), bhendi (Prakash et al., 2014a), sesame (Prakash et al., 2014b) and rice (Prakash et al., 2014c).

All the yield parameters such as pod length, number of pods plant\(^{-1}\), pod yield plant\(^{-1}\), number of seeds pod\(^{-1}\), seed yield plant\(^{-1}\) and hundred seed weight were also higher in pungam leaf powder pelleted treatment @ 200g kg\(^{-1}\) when compared to the other treatments and control (Tables 2, 3).

It may be concluded that with pungam leaf powder pelleting @ 200 g kg\(^{-1}\) as recorded higher biometric and yield parameters under natural saline condition and therefore, in areas where nutrient deficiencies are more common, such type of seed pelleting with pungam leaf powder @ 200 g kg\(^{-1}\) can be recommended for getting more yield of legume like cluster been in those areas and moderately saline areas.

REFERENCES


