MOCHAI SEED QUALITY ENHANCEMENT TECHNIQUES UNDER RAINDROE CONDITIONS OF TRIBAL HABITATIONS OF HOSUR FOREST DIVISION

V. VIJAYA GEETHA1 AND M. BHASKARAN2
1– Assistant Professor, Department of Seed Science and Technology, Krushi Vigyan Kendra, TNAU, Vriddhachalam, India.
2–Special Officer (Seeds), Seed Centre, TNAU, Coimbatore - 641 003, India.

Abstract: In India out of the total population, 8 per cent accounting nearly 168 million people are tribal farmers. Out of these a reasonable population lives in the hilly areas of north western regions of Tamil Nadu comprising Krishnagiri as one of the district (Anon 2002). The tribal farmers in these areas practice traditional crop cultivation methods and realize very little output. Hence, the life style of those farmers contributed by their crop components in their farming and per capita income has not met with any improvement over the past several decades. Although several agro techniques possibly capable of improving their net income as well as their standard of living are available, the ignorance of the farmers due to their remoteness has been a major negative factor. The present study under the Forest Development Agency sponsored research programme mainly focussed to obviate the maladies existing in the tribal society in the way of knowledge gain and adoption of newer techniques. The existing crop components comprise of only ragi and mochai of traditional varieties. The traditional varieties are not only poor in their yield but are also marginally managed. Irrespective of varieties mochai seeds hardened with 2% prosopis leaf extract and pelleted with 50 g kg–1 rhizobium was found superior over other treatments by recording higher emergence percentage, early flowering, maximum number of pods and seed yield plant–1 and resultant seed quality under pot culture study. Similarly the same treatment was evinced its superiority in field condition also.

Key words: Seed hardening, Mochai, Prosopis, Pungam, Rhizobium, Seed pelleting.

I. Introduction

The main goal of the study is rehabilitation and improving the productivity of land owned by tribals and other forest dependents of Hosur forest division into a productive agro system by improving the economic profitability of the people. In these areas, crop production is ventured, which is subjected to high degree of uncertainty in terms of productivity. It is imperative to evolve a suitable strategy for augmenting the productivity of such soils. The raigned agriculture in the plains has benefited tremendously through the evaluation and adoption of many seed and crop management techniques. Among these, seed hardening and pelleting is one of the most important low cost technique which can impart drought tolerance besides achieving enhanced seedling vigour. This low cost seed management technique is considered as a highly suitable component in tribal farming. The yield potential of any crop under rainfed / dry land conditions is decided by various factors like climate, agronomic practices, nutrients status of the soil and quality of input materials especially seed. To boost the productivity under rainfed conditions, all the above said factors are to be managed carefully. Since agronomic practices and nutrient status can be easily managed, much emphasis has to be given to overcome moisture stress, which is a major constraint in dry land farming. Moisture stress during initial establishment affects the crop stand as well as the productivity (Bhaskaran, 1995). Various pre sowing physiological and chemical seed treatment methods are available to increase the productivity of various crops. But such seed treatment methods are not practicable to the farmers, mainly due to the non-availability of chemicals and also due to the high cost of these chemicals. Seed hardening and pelleting is a pre sowing seed treatment, which can make the seed to withstand drought during early phase of germination and seedling growth. Seed hardening technique is commonly followed using chemicals and botanicals. The efficiency of locally available eco-friendly plant products as the major component in seed hardening has been well documented and have to be demonstrated in the target production environment of tribal areas. Taking into consideration of the present status of farming in the study area this study was programmed with the objective to evaluate the sustainability of improved varieties of mochai under rainfed condition and also to evolve eco friendly integrated seed and crop management practices suitable for successful establishment of crops for increasing the productivity under tribal field.
II. Materials and Methods

Genetically pure seed materials of different varieties were obtained as furnished below and served as the base materials for the laboratory and field experiments. To realize the objective of the study, the seeds were treated and evaluated both in laboratory and the field experiments were conducted at Kottayam village, Denganikottai range of Hosur Forest Division, Krishnagiri, Tamil Nadu. Throughout the crop growth period of field experiment, the crops showered through normal receipt of rainfall combined with optimal climatic condition.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mochai</td>
<td>CO 1</td>
<td>Department of Pulses, TNAU, Coimbatore.</td>
</tr>
<tr>
<td>(Lablab purpurens)</td>
<td>Local variety</td>
<td>Tribal farmer, Kottayam, Denganikottai range of Hosur Forest Division, Krishnagiri.</td>
</tr>
</tbody>
</table>

The seeds of mochai cv. CO 1 and local variety were cleaned, dried and graded and evaluated for its initial germination potential then the seeds were subjected to the following treatments.

- **T**1 - Control
- **T**2 - Seed hardening with 2% Prosopis leaf extract for 4 h
- **T**3 - Red earth @ 10 g kg⁻¹ seed dissolved in 5 ml of water
- **T**4 - T2+ seed pelleting 50 g rhizobium kg⁻¹ of seed

### Varieties
- V1 - CO 1
- V2 - Local variety

The seed samples were drawn from the above treatments and evaluated for the following seed quality parameters during 2003 in the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore by adopting Factorial Completely Block Design with five replications.

#### Laboratory evaluation

- **Germination** (ISTA, 1999) and **Vigour index** (Abdul-Baki and Anderson, 1973)

#### Field experiment

A field trial was conducted during 2003–2004 at Kottayam village of Denganikottai range of Hosur Forest Division under rainfed conditions by adopting Factorial Randomized Block Design with five replications. The crop was raised with recommended package of practices and the following growth and yield parameters were recorded.

- **Days to emergence**
- **Number of pods plant⁻¹**
- **Weight of pod plant⁻¹**
- **Seed yield plant⁻¹**

### III. Results

#### Germination (per cent) (Table 1)

The results of hardening and pelleting treatments showed significant difference in germination. The maximum germination percentage of 84 was recorded by the treatment T4 while the treatment T1 recorded the lowest value of 73 per cent. Between the varieties, V1 recorded maximum germination of 90 per cent, while V2 recorded the minimum (67%). The interaction between treatments and varieties were significant. V1T4 recorded higher germination per cent of 96 compared to V2T1 (63 %).

#### Vigour index (Table 1)

Vigour index values of all the treatments were significantly higher when compared to control. The seeds given with treatment T4 recorded the highest vigour index of 3747 followed by the treatment T2 (3425) and the lowest vigour index was recorded by T1 (2697). Between the varieties, V1 recorded the highest vigour index of 4226 compared to V2 (2200). The interaction between treatments and varieties were significant. Maximum vigour index was recorded inV1T4 (4915) compared to V2T1 (1839).

#### Field emergence (per cent) (Table 2)

The field emergence percentage of hardened seeds was higher in treatment T4 (71) followed by the treatment T2 (68 %), while the lowest field emergence was observed in T1 (64 %). In case of varieties, V1 recorded the maximum field emergence of 74 per cent compared to V2 (60 %). The interaction
between treatments and varieties were significant. Higher field emergence was recorded in $V_1T_4$ (77%) when compared to $V_2T_1$ (56%).

**Pods plant$^{-1}$ (Table 2)**

The number of pods plant$^{-1}$ varied significantly due to treatments. $T_4$ (26.8) recorded the maximum number of pods followed by $T_2$ (25.3), while the $T_1$ recorded the minimum (22.5). Among the varieties, $V_1$ recorded maximum of 28.3 pods plant$^{-1}$ compared to $V_2$ (21.3). The interaction between treatments and varieties were significant. Maximum numbers of pods were recorded in $V_1T_4$ (31) when compared to $V_2T_1$ (20).

**Pod weight (g) (Table 2)**

Significant differences were recorded in mean pod weight due to treatments. Among the treatments $T_4$ (4.65 g) had higher pod weight followed by $T_2$ (4.42 g). The pod weight was lower in $T_1$ (4.02 g). Among the varieties $V_1$ (5.55 g) had maximum pod weight and $V_2$ recorded the minimum of 3.14 g. The interaction between treatments and varieties were not significant.

### Table 1. Effect of seed hardening and pelleting on germination (per cent), shoot and root length (cm) of selected cultivars of mochai under laboratory condition

<table>
<thead>
<tr>
<th>Treatments (T)</th>
<th>Varieties (V)</th>
<th>Mean Germination per cent</th>
<th>Mean Shoot length (cm)</th>
<th>Mean Root length (cm)</th>
<th>Varieties (V)</th>
<th>Mean Vigour index</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_1$</td>
<td>$V_1$</td>
<td>84 (66.04)</td>
<td>63 (52.24)</td>
<td>73 (59.14)</td>
<td>$V_1$</td>
<td>3556</td>
</tr>
<tr>
<td>$T_1$</td>
<td>$V_2$</td>
<td>63 (52.24)</td>
<td></td>
<td></td>
<td>$V_2$</td>
<td>1839</td>
</tr>
<tr>
<td>$T_2$</td>
<td>$V_1$</td>
<td>92 (74.00)</td>
<td>69 (55.86)</td>
<td>80 (64.93)</td>
<td>$V_1$</td>
<td>4529</td>
</tr>
<tr>
<td>$T_2$</td>
<td>$V_2$</td>
<td>69 (55.86)</td>
<td></td>
<td></td>
<td>$V_2$</td>
<td>2322</td>
</tr>
<tr>
<td>$T_3$</td>
<td>$V_1$</td>
<td>88 (69.30)</td>
<td>65 (53.85)</td>
<td>76 (61.57)</td>
<td>$V_1$</td>
<td>3904</td>
</tr>
<tr>
<td>$T_3$</td>
<td>$V_2$</td>
<td>65 (53.85)</td>
<td></td>
<td></td>
<td>$V_2$</td>
<td>2000</td>
</tr>
<tr>
<td>$T_4$</td>
<td>$V_1$</td>
<td>96 (77.90)</td>
<td>71 (57.67)</td>
<td>84 (67.78)</td>
<td>$V_1$</td>
<td>4915</td>
</tr>
<tr>
<td>$T_4$</td>
<td>$V_2$</td>
<td>71 (57.67)</td>
<td></td>
<td></td>
<td>$V_2$</td>
<td>2579</td>
</tr>
<tr>
<td>Mean</td>
<td>$V_1$</td>
<td>90 (71.81)</td>
<td>67 (54.91)</td>
<td></td>
<td>$V_1$</td>
<td>4226</td>
</tr>
<tr>
<td>Mean</td>
<td>$V_2$</td>
<td>67 (54.91)</td>
<td></td>
<td></td>
<td>$V_2$</td>
<td>2200</td>
</tr>
</tbody>
</table>

**CD (P=0.05)**

(Figures in parentheses indicates arc sine values)

### Table 2. Effect of seed hardening and pelleting on field emergence (per cent), days to initial and 50 per cent flowering of selected cultivars of mochai under field experiment

<table>
<thead>
<tr>
<th>Treatments (T)</th>
<th>Varieties (V)</th>
<th>Mean Field emergence</th>
<th>Mean Pods plant$^{-1}$</th>
<th>Mean Pod weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$V_1$</td>
<td>72 (57.85)</td>
<td>56 (48.26)</td>
<td>64 (53.05)</td>
</tr>
<tr>
<td></td>
<td>$V_2$</td>
<td>72 (57.85)</td>
<td>64 (53.05)</td>
<td>25 (20)</td>
</tr>
<tr>
<td>$T_1$</td>
<td>$V_1$</td>
<td>74 (59.57)</td>
<td>62 (51.95)</td>
<td>68 (55.76)</td>
</tr>
<tr>
<td>$T_1$</td>
<td>$V_2$</td>
<td>74 (59.57)</td>
<td>68 (55.76)</td>
<td>29 (22)</td>
</tr>
<tr>
<td>$T_3$</td>
<td>$V_1$</td>
<td>74 (59.35)</td>
<td>58 (49.61)</td>
<td>66 (54.48)</td>
</tr>
<tr>
<td>$T_3$</td>
<td>$V_2$</td>
<td>74 (59.35)</td>
<td>66 (54.48)</td>
<td>28 (21)</td>
</tr>
<tr>
<td>$T_4$</td>
<td>$V_1$</td>
<td>77 (61.31)</td>
<td>65 (53.74)</td>
<td>71 (57.43)</td>
</tr>
<tr>
<td>$T_4$</td>
<td>$V_2$</td>
<td>77 (61.31)</td>
<td>71 (57.43)</td>
<td>31 (23)</td>
</tr>
<tr>
<td>Mean</td>
<td>$V_1$</td>
<td>74 (59.47)</td>
<td>60 (50.89)</td>
<td>28.3 (21.3)</td>
</tr>
<tr>
<td>Mean</td>
<td>$V_2$</td>
<td>74 (59.47)</td>
<td>60 (50.89)</td>
<td>28.3 (21.3)</td>
</tr>
</tbody>
</table>

**CD (P=0.05)**

(Figures in parentheses indicates arc sine values)

### IV. Discussion

Ragi and mochai crops grown under tribal farmers’ area record low yield due to usage of traditional varieties and non adoption of latest production technologies. Hence in order to create awareness among the tribal farmers about the improved varieties and techniques and to exploit the production potentiality of their
tribal land productivity, which will enable to rehabilitate and improve their economic profitability and health status the study was carried out and the results obtained are discussed here under.

Pulses are a valuable source of proteins, vitamins and minerals in our daily diet. An increased supply of pulses in our daily diet will go a long way to alleviate the basic problem of widespread protein – caloric malnutrition in our country. They play a major role in crop rotation and diversification and keep the soil alive and productive by enriching the soil fertility in terms of nitrogen and organic matter. Generally pulses are considered as poor yielder compared to cereals and this is not only due to the characteristics of the plant type, but also due to condition of cultivation (Gopal Singh and Hiremath, 1992; Sasikala and Krishnasamy, 1995). In general, pulses are grown almost entirely in marginal and rainfed areas. The major constraint for higher productivity of pulses in dryland is inadequacy of soil moisture and poor fertility status of the soil.

Presowing hardening namely hydration and dehydration of seed is one of the methods which results in modifying physiological and biochemical nature of seed so as to get the characters that are favourable for drought resistance (Henckel, 1964). Use of plant materials as manure and for pest and disease control has become common. The present approach is also organic based with easily accessible materials to the farmers at negligible cost. The fresh leaf extracts of some of the uncared plants for example; prosopis, pungam and acacia have been found to be useful to harden the seeds with greater benefits than a number of chemicals. In the present study, the seeds hardened with 2% prosopis leaf extract gave 11 per cent higher germination than control seeds in both varieties at all stages of evaluation viz., laboratory, pot culture and field experiment.

As the seedling from prosopis hardened and pelleted seeds possessed 38.9 per cent higher vigour index, they could able to survive and establish well even under field conditions with 70 per cent, which was 9.4 per cent higher than the plants survived in the untreated control. Thus the results clearly indicate the promising effect of hardening and pelleting in mochai for improving the germination which indicates early hydration and imbibition. This was further confirmed and reflected through the expression of higher germination, seedling growth and vigour index of same seeds in the laboratory evaluation irrespective of varieties. However the influence and activity was pronounced in cv. CO 1 compare to local variety which showed poor response for the hardening treatments. This might be due to the improved variety had genetic capability of responding to seed quality enhancement techniques in the form of enhanced physiological and biochemical manifestation than local variety (Bhaskaran, 1995).

In the present study, number of pods plant⁻¹, pod weight, seed weight pod⁻¹ were more from the plants raised from seeds hardened and pelleted with prosopis leaf extract. The pod yield was 21.6 per cent higher than control seeds such a positive effect on pod yield attributes was reported by Kuppusamy et al. (1992) in greengram; and Ponnuswamy and Vijaya (1997) in cowpea; Sabir-Ahamed (1999) and Basaria Begam (2001) in blackgram. The increased pod yield also due to un aborted reproductive structures could have resulted due to higher photosynthetic activity, moreover, increased level of phosphorus (Durai Singh, 1988) could have promoted adequate vegetative structure to produce more number of reproductive sinks.

The seed yield plant⁻¹ was higher by 38.6 per cent in the plants of prosopis hardened and pelleted seeds over control (fig. 1). The hardening cum pelleting treatment might have improved the growth of the plant during early stages with increased vigour and associated stronger root system, which in turn derived the available soil moisture and nutrients enabling better growth resulting in higher yield. (Jegathambl, 1996). Similar increased yield due to pelleting was Vijaya (1996) in blackgram, Jayaseelan (1997) in greengram, Jayaseelan (1997) in redgram, Ponnuswamy and Vijaya (1997) in cowpea, Srimathi and Malarkodi (2000) in soybean, and Kavitha (2002) in blackgram and green gram.

V. Conclusion

Investigation on the influence of seed hardening on mochai cv. CO 1 and local variety revealed that hardening with prosopis leaf extract (2%) for 4 h and pelleted with Rhizobium (50 g kg⁻¹) recorded maximum germination (83.5 %) and high seedling vigour. The field emergence potential of prosopis hardened and rhizobium pelleted seeds were also higher (11.1 %). Number of pods plant⁻¹, pod weight, seed yield plant⁻¹ and seed yield ha⁻¹ were also at the increasing level and registered maximum values for prosopis hardened and pelleted seeds than other treatments. Higher seed yield of 1638 kg ha⁻¹ was recorded for prosopis hardened and pelleted seeds due to this treatment effect, the seed yield ha⁻¹ was increased by 58 per cent when compared to control.

References


