Introduction

*Erythrina indica* Lam. (Fabeaceae) is a deciduous armed tree, 10-20 m tall with 1m dbh. It is a common plant with grayish with bark and coarse branches glabrous sparsely armed with short prickles found in India. It is known as kalyana murukku or mulu murunkkai in Tamil [1]. In siddha system, it is being considered useful for treating antihelmintiasis, nematocidal and wound infection and also used as sedative and anti-inflammatory [2-4]. The presence of active constituents viz. alkaloids, glycosides, phenyl coumarin, proteins, carbohydrates, amino acids, steroids, tannins has been reported from root and seeds [5,6]. According to Harwell [7] seeds of *Erythrina* used in folk remedies for cancer, whose bark is used for fever, hepatitis, malaria, rheumatism, toothache also for boils and fractures. Fresh leaf paste is applied on the wounds of the cattle for healing [8]. Root is used for rheumatism, bark and leaves serve as a vermifuge [9].

Due to these advantages, Government and non-government organizations have planted avenue trees in the public land in urban area and highways. At present the pinch on fertilizer consumption is being felt more in India, since the country cannot afford to either import the required fertilizer at high cost and subsidize the sale to the farmers or build new fertilizer plants at formidable cost. Hence farmers are prepared to take to organic farming by using bio-inoculants. Bio-inoculants are cost effective and ecofriendly natural inputs providing alternate source of plant nutrients, thus increasing farm income by providing extra yields and reducing input cost also. Bio-inoculants increase crop yield by 20-30%, replace chemical N & P by 25%, stimulate plant growth, activate plant nutrients, thus increasing farm income by providing extra yields and reducing input cost also. Bio-inoculants increase crop yield by 20-30%, replace chemical N & P by 25%, stimulate plant growth, activate plant nutrients, thus increasing farm income by providing extra yields and reducing input cost also. Bio-inoculants increase crop yield by 20-30%, replace chemical N & P by 25%, stimulate plant growth, activate plant nutrients, thus increasing farm income by providing extra yields and reducing input cost also.

Materials and Methods

Seeds

*Erythrina* fruits were collected from a single tree, located at the semi arid region of Karia Kudi in Sivagangai district of Tamil Nadu, India. Seeds were separated and graded and uniform size was used for raising seedlings. Seedlings were raised in a mixture of unsterilized sand: Red soil: Farm Yard Manure (2: 1: 1) in polythene bag (Plate1-4). In order to find out suitable bio-inoculants and their combinations to achieve maximum overall growth and minimise the cost of seedling production of the following treatments were given seven days after germination.

*Azospirillum* and phosphobacterium

Lignite based carrier culture of *Azospirillum* (*Azospirillum brasilense*) and Phosphobacterium (*Bacillus megaterium* var. .

The soil used for the production of planting stock in the forest nurseries is very low in nutrient and beneficial microbial population. Though the soil is mixed with farm yard manure (FYM), the quality of seedling is very poor due to insufficiency of desired microorganisms (many of the microorganisms are host specific) and the rate of mineralization and nitrogen fixation is very low, as a result the quality of the seedling is very poor. It is very difficult to establish in the initial stage in the field with these seedlings. This problem can be overcome by providing suitable biofertilizers. It has been already reported that the use of biofertilizers results in better growth and nutrient uptake in seedlings. Plants colonized by mycorrhizal fungi are better adapted to withstand drought in the nursery and field by phosphorus mediated system. Phosphobacterium will solubilize Phosphorus insoluble forms of phosphate and they help plants to absorb and translocate more soluble phosphate [20]. Nitrogen fixing bacteria of genus *Azospirillum* have promoted tree growth [21]. Similarly, bioinoculants improve the quality of tree seedlings of *Casuarina equisetifolia* [22], *Moringa oleifera* [23], *Acacia nilotica* [24], *Azadirachta indica* [25] and *Delonix regia* [26]. However, the efficiency of individual and combined inoculation of biofertilizers in the *Erythrina* seedlings needs to be studied. Hence, the present study was undertaken to find out the compatibility of different biofertilizers and their augmentation effect of quality seedling production of *Erythrina*. **

*Corresponding author: Dr. Kuppurajendran, Assistant Professor, Research Centre in Botany, Tamilnadu, India

Received February 27, 2012; Accepted March 23, 2012; Published March 23, 2012

Citation: Kuppurajendran (2012) Effects of Bioinoculants on Seedling Growth, Biochemical Changes and Nutrient Uptake of *Erythrina Indica* L. In Semi Arid Region of Southern India. J Biomet Biostat 3:134. doi:10.4172/2155-6180.1000134

Copyright: © 2012 Kuppurajendran. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
with a population load of 10⁸ and 10⁹ colony forming units / gram of peat soil respectively were obtained from the Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.

AM fungi

AM fungus (Glomus fasciculatum) was isolated and recorded as dominant species in the rhizosphere soil of Erythrina. It was multiplied in pot culture in the sterilized mixture of sand: soil (1: 1 v/v) and maintained in the roots of Erythrina Indica as the host plant. The inoculum contained extramatrical hyphae, chlamydospores and infected root segments were added in the root zones of each seedling.

Treatment

Seedlings were raised in 13 x 26 cm. size polyethylene bags with a potting mixture of unsterilized sand: red soil: farm yard manure (2: 1: 1). Seven days after germination in polyethylene bags 10 grams of peat soil based culture of Azospirillum, Phosphobacterium and AM fungus were inoculated by making holes in the rhizosphere of seedlings.

T₁ - Azospirillum (Azospirillum brasilense)
T₂ - Phosphobacterium (Bacillus megaterium var. phosphoticum)
T₃ - Arbuscular Mycorrhizal Fungi (AMF) (Glomus fasciculatum)
T₄ - Azospirillum + Phosphobacterium
T₅ - Azospirillum + AMF
T₆ - Phosphobacterium + AMF
T₇ - Azospirillum+ Phosphobacterium+ AMF
T₈ - Control (Sand: Red soil: Farm Yard Manure 2:1:1)

Experimental design

Nursery experiment was conducted at the Department of Rural Development, Alagappa University, Karaikudi, Tamil Nadu, India. The experiment was set up in a completely randomized block design with 8 treatments and twenty four replicates. All the plants were kept under identical nursery condition up to 120 days.

Seedling survival percentage was calculated using the following formula:

Seedling survival percentage =

\[
\frac{\text{Number of seedlings present in each treatment}}{\text{Total number of seedlings transplanted in each treatment}} \times 100
\]

Harvesting and measurement

120 days after transplanting from each treatment, a total of 12 seedlings were randomly selected and height and basal diameter were recorded. Seedlings were carefully uprooted without disturbing the root system and washed in running tap water. Excess of water was wiped out by placing them between folds of blotting paper. The seedlings were cut at collar region, dried separately at 70°C in paper bags in hot air oven and biomass estimation (root and shoot dry weight) was carried out using top pan electronic balance.

Assessment of mycorrhizal infection

Mycorrhizal root infection was assessed following the procedure of Phillips and Hayman [27]. The root segments were placed in a 2.5% aqueous solution of KOH (w/v) and boiled in a water bath at 90°C for 15 minutes. The roots were rinsed in water and lightened in H2O2 (3 ml of 20% NH4OH in 30 ml H2O2) for 10-45 minutes. They were again thoroughly rinsed with water several times and acidified by soaking in 40 - 50 ml of 1% HCl for 3 min. Acidified roots were stained in an acidic glycerol solution (500 ml glycerol, 450 ml H2O, 50 ml 1% HCl) containing 0.05% trypan blue. The trypan blue solution was poured off and the roots were de-stained in acidic glycerol at room temperature. The stained roots were mounted in a glass slide and percentage of infection was calculated.

Seedlings survival percentage

Seedlings Quality Index was calculated using the formula of Dickson et al. [28].

\[
\text{Seedlings Quality Index (SQI)} = \frac{\text{Total weight (g / plant)}}{\left( \frac{\text{Height (cm)}}{\text{Shoot weight (g / plant)}} \right) + \text{Root collar diameter (mm)} + \text{Root weight (g / plant)}}
\]

Nutrient analysis

Plant samples were taken for the bio-chemical analysis. The oven-dried plant samples were ground to pass through a 0.5 millimeter plastic sieve before digestion.

Nitrogen and phosphorous

The dried plant material was ground in a mortar and pestle and the total nitrogen content was estimated by the conventional micro-Kjeldahl method [29]. Total phosphorus was estimated by the method of Fiski-Subba-Rao as modified by Bartlett [30].

Estimation of total potassium, calcium and magnesium

1 gram of plant sample was digested with tri-acid mixture with HNO₃: H₂SO₄: HClO₄ in the ratio of 9:2:1 until it became colorless. After digestion it was filtered and the volume was made up to 100 ml. Potassium in the extract was determined using a flame photometer [31]. Calcium and Magnesium were determined by the Versenate method as described by Jackson [31].

Estimation of chlorophyll and protein

Chlorophyll-a, chlorophyll-b and total chlorophyll content was estimated by the method of Yoshida et al. [32] and total protein by Lowry et al.[33].

Statistical analysis

The data were statistically analyzed by analysis of variance (ANOVA) and treatment means were separated using Duncan's Multiple Range Test (P< 0.05) [34].

Results

Seedling survival

100% germination and survival was recorded in E. indica seedlings in the nursery condition. Statistically, there is no variation between microbial inoculants seedlings and control (Table 1).

Shoot length, root length and basal diameter

Significant differences in shoot length, root length and basal diameter were recorded in E. indica seedlings inoculated with the different microbial inoculants compared to the uninoculated control (Plate 2) (Table 1).
Impact of bioinoculants on the seed germination and growth of Erythrina indica seedlings.

### Shoot length
From the analysis of growth data the individual inoculation of Azospirillum (T1) treated seedlings was found to be the most effective in increasing the growth and biomass. Among all the treatments, the individual inoculation with Azospirillum (T1) recorded maximum shoot length increase (57.71%) over the control followed by combined inoculation of Azospirillum + Phosphobacterium (T4) with 45.00% increase over control, 120 days after inoculation (Table 1).

### Root length
Significant differences in root length were recorded in E. indica seedlings inoculated with different microbial inoculants compared to the uninoculated control (Table 1). From the analysis of growth data, the individual inoculation of Azospirillum (T1) was found to be the most effective in increasing the root length of seedlings.

Among all the treatments, the individual inoculation with Azospirillum (T1) showed maximum root length 15.82 cm (41.76% increase over the control). The combined inoculation of Azospirillum + Phosphobacterium+ AMF (T7) showed higher root length and was statistically on a par with a mix with Azospirillum + Phosphobacterium (T4) inoculated seedlings.

### Basal diameter
Azospirillum (T1) inoculated seedlings showed better growth than other single treatment (74.54% increases over the control). The combined inoculation of Azospirillum + Phosphobacterium + AMF (T1) showed significantly higher growth statistically on a pair with Azospirillum (T1) inoculated seedlings. Among the double inoculation Azospirillum + Phosphobacterium (T1), Azospirillum + AMF (T1) and Phosphobacterium + AMF (T6) registered higher levels of basal diameter. Phosphobacterium (T1) and AMF (T1) inoculated seedlings showed similar growth over other treatments (Table 1).

### Shoot biomass
The data pertaining to dry matter accumulation of shoot, root and total biomass are presented in Table 2. Significant differences were observed among the treatments evaluated 120 days after inoculation. The highest biomass in the shoot was recorded in seedlings inoculated with Azospirillum + Phosphobacterium + AMF (T1). It was statistically on a par with seedlings treated with Azospirillum (T1). They registered 71.30% and 61.55% increase over control (Table 2).

### Root biomass
Statistically highly significant difference was found in different type of microbial inoculation on root biomass of Erythrina seedlings. Inoculation of Azospirillum (T1) alone and in combination with other inoculants was found to significantly increase root biomass when compared to other treatments. Root biomass was highest in Azospirillum (T1) followed by Azospirillum + Phosphobacterium + AMF (T7) (Table 2).

### Total biomass of seedling
Seedling biomass was the highest in the Azospirillum (T1) treated seedlings and it was 65.23% more than that of the control and it was statistically on a par with seedlings treated with Azospirillum + Phosphobacterium + AM (T7). In the dual inoculation seedlings inoculated in combination with Azospirillum recorded more biomass than the control (Table 2).

### Seedling quality index
Good quality seedlings were obtained from seedlings inoculated with Azospirillum (T1). Azospirillum + Phosphobacterium + AMF (T1) showed the next highest quality index, followed by Azospirillum + Phosphobacterium + AM (T7). Among the double inoculations Azospirillum + AMF (T1) showed the highest seedling quality index (Figure 1 & Table 2).

### Table 1: Impact of bioinoculants on the seed germination and growth of Erythrina indica seedlings.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Seed Germination (%)</th>
<th>Collar diameter (mm plant⁻¹)</th>
<th>Shoot height (cm plant⁻¹)</th>
<th>Root height (cm plant⁻¹)</th>
<th>Total height (cm plant⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>100.00</td>
<td>1.11²</td>
<td>40.20</td>
<td>15.82</td>
<td>56.02</td>
</tr>
<tr>
<td>T₂</td>
<td>100.00</td>
<td>0.89³</td>
<td>30.00</td>
<td>12.16</td>
<td>42.16</td>
</tr>
<tr>
<td>T₃</td>
<td>100.00</td>
<td>0.77⁹</td>
<td>26.29</td>
<td>12.18</td>
<td>38.47</td>
</tr>
<tr>
<td>T₄</td>
<td>100.00</td>
<td>0.83¹</td>
<td>36.96</td>
<td>14.03</td>
<td>50.99</td>
</tr>
<tr>
<td>T₅</td>
<td>100.00</td>
<td>0.78³</td>
<td>31.74</td>
<td>13.29</td>
<td>45.03</td>
</tr>
<tr>
<td>T₆</td>
<td>100.00</td>
<td>0.98⁴</td>
<td>26.32</td>
<td>12.32</td>
<td>38.64</td>
</tr>
<tr>
<td>T₇</td>
<td>100.00</td>
<td>0.89⁴</td>
<td>35.31</td>
<td>14.49</td>
<td>49.80</td>
</tr>
<tr>
<td>T₈</td>
<td>100.00</td>
<td>0.66³</td>
<td>25.49</td>
<td>11.16</td>
<td>36.65</td>
</tr>
</tbody>
</table>

Means followed by a common letter(s) in the same column are not significantly different at the 5 % level by DMRT.

**Treatments:** T₁ - Azospirillum; T₂ - Phosphobacterium; T₃ - AMF; T₄ - Azospirillum + Phosphobacterium; T₅ - Azospirillum + AMF; T₆ - Phosphobacterium + AMF; T₇ - Azospirillum + Phosphobacterium + AMF; T₈ - Control

### Table 2: Impact of bioinoculants on the dry matter production and seedling quality index of Erythrina indica seedlings.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Shoot dry weight (gram/ plant⁻¹)</th>
<th>Root dry weight (gram/ plant⁻¹)</th>
<th>Total dry weight (gram/ plant⁻¹)</th>
<th>Seedling quality index</th>
<th>AM fungal colonization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>12.10</td>
<td>6.67</td>
<td>18.77</td>
<td>0.360</td>
<td>13</td>
</tr>
<tr>
<td>T₂</td>
<td>7.63</td>
<td>4.02</td>
<td>11.65</td>
<td>0.237</td>
<td>14</td>
</tr>
<tr>
<td>T₃</td>
<td>7.49</td>
<td>4.13</td>
<td>11.62</td>
<td>0.227</td>
<td>43</td>
</tr>
<tr>
<td>T₄</td>
<td>11.09</td>
<td>4.90</td>
<td>15.99</td>
<td>0.251</td>
<td>12</td>
</tr>
<tr>
<td>T₅</td>
<td>10.13</td>
<td>4.69</td>
<td>14.82</td>
<td>0.248</td>
<td>35</td>
</tr>
<tr>
<td>T₆</td>
<td>8.50</td>
<td>3.71</td>
<td>12.21</td>
<td>0.295</td>
<td>33</td>
</tr>
<tr>
<td>T₇</td>
<td>12.83</td>
<td>5.96</td>
<td>18.79</td>
<td>0.325</td>
<td>62</td>
</tr>
<tr>
<td>T₈</td>
<td>6.23</td>
<td>3.87</td>
<td>9.00</td>
<td>0.158</td>
<td>8</td>
</tr>
</tbody>
</table>

Means followed by a common letter(s) in the same column are not significantly different at the 5 % level by DMRT.

**Treatments:** T₁ - Azospirillum; T₂ - Phosphobacterium; T₃ - AMF; T₄ - Azospirillum + Phosphobacterium; T₅ - Azospirillum + AMF; T₆ - Phosphobacterium + AMF; T₇ - Azospirillum + Phosphobacterium + AMF; T₈ - Control

**Citation:** Kuppurajendran (2012) Effects of Bioinoculants on Seedling Growth, Biochemical Changes and Nutrient Uptake of Erythrina Indica L. In Semi-Arid Region of Southern India. J Biomet Biostat 3:134. doi:10.4172/2155-6180.1000134

**ISSN:** 2155-6180 JBMBS, an open access journal

**Volume 3 • Issue 2 • 1000134**
Mycorrhizal infection

Mycorrhizal infection was found only in seedlings inoculated with AM fungi and the combined inoculation of *Azospirillum* + Phosphobacterium+ AMF (T7) showed higher levels of infection followed by AMF (T3) inoculated seedlings (Plate 3 & Table 2).

Total chlorophyll content

Total chlorophyll content was found to be maximum in the seedlings inoculated with *Azospirillum* (4.650 mg/g fresh weight of leaves) followed by *Azospirillum* + Phosphobacterium + AMF (3.49 mg/g fresh weight of leaves) (Table 3).

**Protein content**

Among all the treatments, protein content in tissue of *Erythrina* seedlings was found to be maximum in the seedlings produced from single application of *Azospirillum* (0.048 mg/plant) and triple application of *Azospirillum* + Phosphobacterium + AMF (0.075 mg/plant).

---

Table 3: Impact of bioinoculants on chlorophyll and protein content (mg / plant) of *Erythrina indica* seedlings.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Protein (mg/gram fresh weight)</th>
<th>Chlorophyll a (mg/g fresh weight)</th>
<th>Chlorophyll b (mg/g fresh weight)</th>
<th>Chlorophyll b (mg/g fresh weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>0.04684</td>
<td>1.06576</td>
<td>0.81452</td>
<td>1.88028</td>
</tr>
<tr>
<td>T2</td>
<td>0.03996</td>
<td>0.94088</td>
<td>0.61456</td>
<td>1.56444</td>
</tr>
<tr>
<td>T3</td>
<td>0.03108</td>
<td>0.81484</td>
<td>0.68748</td>
<td>1.50232</td>
</tr>
<tr>
<td>T4</td>
<td>0.05328</td>
<td>1.0466</td>
<td>0.9874</td>
<td>2.03400</td>
</tr>
<tr>
<td>T5</td>
<td>0.06216</td>
<td>1.02744</td>
<td>0.9798</td>
<td>2.00724</td>
</tr>
<tr>
<td>T6</td>
<td>0.06660</td>
<td>0.94332</td>
<td>0.76024</td>
<td>1.70356</td>
</tr>
<tr>
<td>T7</td>
<td>0.07548</td>
<td>1.0592</td>
<td>0.8602</td>
<td>1.9194</td>
</tr>
<tr>
<td>T8</td>
<td>0.02222</td>
<td>0.9151</td>
<td>0.5156</td>
<td>1.4307</td>
</tr>
</tbody>
</table>

Means followed by a common letter(s) in the same column are not significantly different at the 5 % level by DMRT

---

Table 4: Dry matter production, nutrient concentration (%) and nutrient uptake (mg/plant) of *Erythrina indica* seedlings inoculated with biofertilizers in nursery condition.
plant) followed by Phosphobacterium + AMF (0.066mg/plant) treatment (Table 3).

Nutrient uptake

Nutrient concentration in plant tissue and nutrient uptake of was higher in seedling inoculated with Azospirillum (T.) treated seedlings and it was statistically on a par with triple inoculation of Azospirillum + Phosphobacterium + AMF. Among all the treatments, the individual inoculation with Azospirillum (T.) recorded as 12.85% of N, 9% of P, 16% of K 24% of Ca and 32 % of Mg was higher than that of control. Similarly, higher percentage of seedling inoculated with Azospirillum + Phosphobacterium + AMF (Table 4).

Discussion

Biologically active products, more appropriately called microbial inoculations, containing active strains of a selective microorganisms like Azospirillum, Phosphobacterium, Arbuscular mycorrhizae alone or in combination, help plant growth through different mechanisms, including biological nitrogen fixation and solubilization of insoluble phosphate fertilizer. In the present study, the height, diameter and dry matter and quality seedlings were higher in the Erythrina seedlings inoculated with bioinoculants. The increase of growth may be attributed to high accumulation of chlorophyll and protein in the plant tissue.

Nitrogen fixing bacteria of the genus Azospirillum have promoted plant growth of agronomically important field crops by 10 to 30% in the field experiment [35,36] crop yield increase in germination rate, plant height, leaf size [37] enhanced minerals and water uptake, increased dry matter accumulation, root surface area, root diameter density and root hair [38] to support the earlier reports. In the present study, Azospirillum inoculated seedlings showed better growth and root biomass when compared to the control. Growth may be attributed due to increased root biomass and accumulation of nitrogen [39], and the production of gibberellins and cytokinin like substances [40] which promote the growth of the seedlings. The above results corroborate with earlier studies on quality seedling production of Casuarina equisetifolia [22], Moringa oleifera [23], Acacia nilotica [24] Delonix regia [26].

Growth promoting effect of inoculation with Azospirillum and Phosphobacterium alone or dual inoculation with both non symbiotic biofertilizers was found in several tree species such as Casuarina [22,41] Casuarina trees treated in farm forestry [42] Moringa oleifera [23]. In the present study Phosphobacterium inoculated seedlings produced better plant height, stem girth and total biomass. It may be due to inoculation of phosphate solubilizing microorganism Bacillus megaterium which has shown stable and consistent capacity to solubilize insoluble phosphorus and thus making it available to plants.

Phosphate plays a major role in the root development [43]. Strelbley [44] reported that P seems to be the most important nutrient involved, other nutrients such as N, P, K, Ca, and Mg are translocated along with AM hyphae. Inoculation with AM fungi is known to improve the mineral nutrient of the host plant [45]. In the present study mycorrhizal infection in roots of seedlings were found only in the inoculated seedlings. It is also recorded that growth medium needs bioinoculants and AMF inoculated seedlings had improved growth and nutrient content especially P uptake in the present result corroborate with earlier reports by Verma and Jamaluddin [46]. And seedlings treated with AM fungi on Azadiracta indica, Rajendran et al. [22] in Casuarina equisetifolia, Rajendran and Jayaseer [24] in Acacia nilotica, Meenakshi sundaram et al. [26] in Delonix regia. This can be attributed to the increased absorbing surface area due to extensive external network of mycelium produced by the VAM fungi in association with the host root system [47].

In the present study dual inoculation of AMF with Phosphobacterium influence the growth and biomass of Erythrina seedlings. It is relevant to mention here that Phosphobacterium by virtue of its capacity to multiply certain growth promoting substances like IAA and GA might induce the growth of Erythrina seedlings [48,49]. Among all the treatments are combined inoculations of Azospirillum + Phosphobacterium +AMF produced excellent growth, biomass and tissue nutrient concentration. The greater height, diameter and dry matter of the Erythrina seedlings due to co-inoculation of all the biofertilizers might strongly improve accumulation of nitrogen due to Azospirillum [50], more phosphorus uptake by Phosphobacterium [43] and VAM fungi [51].

The total chlorophyll and soluble protein content was found to be maximum in the seedlings inoculated with Azospirillum. This increase is in agreement with other findings [52] and was attributed [53] to the greater supply of nitrogen to growing tissues. Similarly increase in chlorophyll and soluble protein content was also recorded in shola species [54] with inoculation of Azospirillum+ Phosphobacterium.

Conclusion

Increasing dry land farming and development technologies for arid lands with soil related constraints now acquire new importance and emerge as new frontiers for agricultural and farm forestry development. Increased agro and farm forestry production has to come through the adoption of better management technology. Long-term sustainability in agriculture and forestry is possible only through the use of low cost farm grown inputs, which work in harmony with nature. Biofertilizers act as perennially renewable inputs helping in better tree crop nutrient management and maintenance of soil health, better soil and water management leading to improved forestry practices. It is inferred that under appropriate technology, the use of efficient microbial inoculants yield increased growth and biomass of Erythrina seedlings. The present study clearly shows that the application of Azospirillum plays a significant role in increasing the growth response of Erythrina seedlings in a stipulated period, thereby producing good quality planting stock. These treated seedlings may perform better in nutrient impoverished soil too.

Reference


