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# Evaluation of The Allelopathic Effect of Eucalyptus Soil as Potting Media on Growth And Germination Of Vegetable Crop

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**ABSTRACT**
*In order to study the allopathic effect of eucalyptus soil as potting media on growth and germination of vegetable crop in chilli and tomato was conducted at college of forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during 2015-16 growth season. An experiment based on a Randomized Block Design with five replications was used. Different depth soil of eucalyptus and combination of sand x F.Y.M included four levels and the traits including germination percentage, root length, shoot length, fresh shoot weight, fresh root weight, dry shoot weight, dry root weight were measured. Analysis of variance showed that they were statistically significant. 20 cm. depth soil of eucalyptus and combination of sand x F.Y.M was found maximum therefore, it is recommended that 20% depth of eucalyptus soil can be given to obtain maximum growth.*
***Keywords:*** *Eucalyptus; Chili; Tomato; Depth of Soil; FYM*

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## INTRODUCTION

Agroforestry is primarily a system where agriculture and forestry are practiced either simultaneously or separately on the same unite of land and has affinities with taungya system of regenerating forests which in Burmese means cultivation of tree and crops. Agriculture in forest is called agro forestry. Allelopathy refers to the beneficial or harmful effects of one plant on and other plant ,both crop and weed species, by the release of chemicals from plants parts by leaching root exudation, volatilization, residues ,decomposition and other processes in both natural and agricultural system. Allelopathy refers to the detrimental and beneficial biochemical.

Eucalyptus is a diverse genus of flowering trees and shrubs (including a distinct group with a multiple-stem mallei growth habit) in the myrtle family, Myrtaceae. Members of the genus dominate the tree flora of Australia. The more than 700 species of eucalyptus are mostly native to Australia, and a very small number are found in adjacent areas of New Guinea and Indonesia. One species, *Eucalyptus deglupta,* ranges as far north as the Philippines. Only 15 species occur outside Australia, with just 9 of these not occurring in Australia. Species of eucalyptus are cultivated widely in the tropical and temperate world, including the Americas, Europe, Africa, the Mediterranean Basin, the Middle East, China, and the Indian subcontinent, though most species do not tolerate frost.

Tomato (*Lycopersicum esculentum* Mill.) play a significant role in the human diet by making it balance and supply most important natural elements viz., vitamins ,minerals ,organic

acids ,folic acids ,essential amino acids ,dietary fibers, carbohydrates and supplementary amount of proteins and colour .The constituents of vegetables have therapeutic value due to ant carcinogenic and antioxidant properties. Vegetables are so common in human diet that a meal tomato without a vegetable is supposed to be incomplete in any part of the world.
The substances that give chili peppers their intensity when ingested or applied topically are capsaicin (8-methyl-N-vanillyl-6-nonenamide) and several related chemicals, collectively called capsaicin *(Capsicum annum)* is a species of the plant genus capsicum native to southern north America and northern south America. This species is the most common and extensively cultivated of the five domesticated capsicums. The species encompasses a wide variety of shapes and sizes of peppers, both mild and hot, ranging from bell peppers to chili peppers. Cultivars are descended from the wild American bird pepper still found in warmer regions of the Americas. In the past some woody forms of this species have been called, but the features that were used to distinguish those forms appear in many populations of *Capsicum annuum* and there is no consistently recognizable Capsicum frutescent species.

## MATERIAL AND METHODS

Soil sample were collected from different level of soil 5cm, 10cm, 15cm, 20cm contact with root from respective selected tree. Various soil mixtures were prepared and filled in polythen bags. It was replicated 5 times in one treatment there were 10 bags, 10 seeds in each poly bags were sown. Different concentration were prepared *i.e.* 5% eucalyptus soil, 10% eucalyptus soil, 15%eucalyptus soil, 20%eucalyptus soil. In this way 8 treatment and 200 polybags of different mixture with 4 (5cm, 10cm, 15cm, 20cm eucalyptus soil) mixture and 50 bags of 5cm depth of soil, 50 bags of 10cm depth of soil, 50 bags of 15cm depth of soil, 50 bags of 20cm depth of soil with variety of tomato and same with variety of chilli filled up polybags were arranged in Randomized Block Design (RBD) on a suitable place in nursery. The media were watered 2 days of interval to maintain moisture for proper germination and healthy seedling growth. The same procedure was followed for both crops.

**Table 1: Soil characteristics of the site**

| Sand (%) | Silt (%) | Clay (%) | Textural Class | Organic carbon (%) | Nitrogen kg $ha^{-1}$ | P kg $ha^{-1}$ | Potassium kg $ha^{-1}$ | Soil pH | EC ($dSm^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|
| 70.4 | 12.0 | 17.6 | Sandy Loam | 17 | 43 | 14.6 | 245 | 7.6 | 0.17 |

## RESULTS AND DISCUSSION

### a) : Germination percentage

Data appeared in the table no. 4.2(a)shows that the maximum germination percentage was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (93.67%), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (83.67%), while the lowest germination in $T_1$ (5cm depth soil x sand x F.Y.M.) with (76.33%). In case of chilli crop the maximum germination percentage was recorded in $T_4$(20cm depth soil x sand x F.Y.M) with (79.33%), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (72.67%), while the lowest germination in $T_1$ (5cm depth soil x sand x F.Y.M.) with (62.33%). Whereas the similar trend was recorded in chilli crop. Similar finding of [5, 6].

**Table 4.2(a) Effect of eucalyptus soil on germination percentage of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$ (5cm depth soil x sand x F.Y.M.) | 76.33 | 62.33 |
| $T_2$ (10cm depth soil x sand x F.Y.M.) | 79.67 | 70.33 |
| $T_3$ (15cm depth soil x sand x F.Y.M.) | 83.67 | 72.67 |
| $T_4$ (20cm depth soil x sand x F.Y.M.) | 93.67 | 79.33 |
| **Overall Mean** | **83.33** | **71.17** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.374 | 0.374 |
| **C. D. (P = 0.05)** | 0.794 | 0.794 |

**4.2. (b): Shoot length (cm)**

Data appeared in the table no.4.2 (b) shows that the maximum shoot length was recorded in $T_4$(20cm depth soil x sand x F.Y.M) with (49.38cm), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (31.87cm), while the lowest shoot length in $T_1$ (5cm depth soil x sand x F.Y.M.) with (27.35cm). Whereas chilli crop the maximum shoot length was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (28.16cm), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (24.17cm), while the lowest shoot length in $T_1$ (5cm depth soil x sand x F.Y.M.) with (22.01cm). Similar finding [5, 6]**.**

**Table 4.2(b) Effect of eucalyptus soil on shoot length (cm) of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$ (5cm depth soil x sand x F.Y.M.) | 24.95 | 22.01 |
| $T_2$ (10cm depth soil x sand x F.Y.M.) | 27.35 | 22.63 |
| $T_3$ (15cm depth soil x sand x F.Y.M.) | 31.87 | 24.17 |
| $T_4$ (20cm depth soil x sand x F.Y.M.) | 49.38 | 28.16 |
| **Overall Mean** | **33.39** | **24.25** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.289 | 0.303 |
| **C. D. (P = 0.05)** | 0.613 | 0.642 |

**(c) :Root length (cm)**

Data appeared in the table no.4.2 (c) shows that the maximum root length was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (6.30cm), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (4.43cm), while the lowest root length in $T_1$ (5cm depth soil x sand x F.Y.M.) with (4.18 cm). While chilli crop the maximum root length was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (4.35cm), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (4.34cm), while the lowest root length in $T_1$ (5cm depth soil x sand x F.Y.M.) with (4.10cm) Similar finding [7,9].

**Table 4.2(c) Effect of eucalyptus soil on root length (cm) of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$ (5cm depth soil x sand x F.Y.M.) | 4.18 | 4.10 |
| $T_2$ (10cm depth soil x sand x F.Y.M.) | 4.37 | 4.27 |
| $T_3$ (15cm depth soil x sand x F.Y.M.) | 4.43 | 4.34 |
| $T_4$ (20cm depth soil x sand x F.Y.M.) | 6.30 | 4.35 |
| **Overall Mean** | **4.82** | **4.51** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.307 | 0.169 |
| **C. D. (P = 0.05)** | 0.651 | 0.358 |

**(d) :Fresh shoot weight (g)**

Data appeared in the table no.4.2 (d) shows that the maximum fresh shoot weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (6.59g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (5.38g), while the lowest fresh shoot weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (4.59).While chilli crop the maximum fresh shoot weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (4.18), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (3.62), while the lowest fresh shoot weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (2.88cm). Similar finding [10, 12].

**Table 4.2(d) Effect of eucalyptus soil on fresh shoot weight (g) of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$ (5cm depth soil x sand x F.Y.M.) | 4.59 | 2.88 |
| $T_2$ (10cm depth soil x sand x F.Y.M.) | 4.72 | 2.90 |
| $T_3$ (15cm depth soil x sand x F.Y.M.) | 5.38 | 3.62 |
| $T_4$ (20cm depth soil x sand x F.Y.M.) | 6.59 | 4.18 |
| **Overall Mean** | **5.32** | **3.39** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.258 | 0.269 |
| **C. D. (P = 0.05)** | 0.547 | 0.570 |

**e) : Fresh root weight (g)**

Data appeared in the table no.4.2 (e) shows that the maximum fresh root weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (3.21g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (2.48g), while the lowest fresh root weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (2.29). While chilli crop the maximum fresh root weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (2.86 g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (2.44g), while the lowest fresh root weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (2.12g). Similar finding [7-12].

**Table 4.2(e) Effect of eucalyptus soil on fresh root weight (g) of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$(5cm depth soil x sand x F.Y.M.) | 2.29 | 2.12 |
| $T_2$(10cm depth soil x sand x F.Y.M.) | 2.30 | 2.33 |
| $T_3$(15cm depth soil x sand x F.Y.M.) | 2.48 | 2.44 |
| $T_4$(20cm depth soilx sand x F.Y.M.) | 3.21 | 2.86 |
| **Overall Mean** | **2.57** | **2.44** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.219 | 0.142 |
| **C. D. (P = 0.05)** | 0.465 | 0.301 |

**f) :Dry shoot weight (g)**

Data appeared in the table no.4.2. (f) shows that the maximum dry shoot weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (1.88g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (1.79g), while the lowest dry shoot weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (1.63). In case of chilli crop the maximum dry shoot weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (1.53 g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (1.51g), while the lowest dry shoot weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (1.27 g). Similar finding given by [4-6].

**Table 4.2(f) Effect of eucalyptus soil on dry shoot weight (g) of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$ (5cm depth soil x sand x F.Y.M.) | 1.63 | 1.27 |
| $T_2$ (10cm depth soil x sand x F.Y.M.) | 1.65 | 1.40 |
| $T_3$ (15cm depth soil x sand x F.Y.M.) | 1.79 | 1.51 |
| $T_4$ (20cm depth soil x sand x F.Y.M.) | 1.88 | 1.53 |
| **Overall Mean** | **1.74** | **1.43** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.057 | 0.065 |
| **C. D. (P = 0.05)** | 0.120 | 0.139 |

**(g) : Dry root weight (g)**

Data appeared in the table no.4.2 (g) shows that the maximum dry root weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (0.92g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (0.77g), while the lowest dry root weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (0.41). In case of chilli crop the maximum dry root weight was recorded in $T_4$ (20cm depth soil x sand x F.Y.M) with (0.72 g), followed by $T_3$ (15cm depth soil x sand x F.Y.M.) with (0.61g), while the lowest dry root weight in $T_1$ (5cm depth soil x sand x F.Y.M.) with (0.50g). Similar finding of [1-3].

**Table 4.2(g) Effect of eucalyptus soil on dry root weight (g) of chilli and tomato.**

| Treatments | Tomato | Chilli |
|---|---|---|
| $T_1$(5cm depth soil x sand x F.Y.M.) | 0.41 | 0.50 |
| $T_2$(10cm depth soil x sand x F.Y.M.) | 0.65 | 0.54 |
| $T_3$(15cm depth soil x sand x F.Y.M.) | 0.77 | 0.61 |
| $T_4$(20cm depth soilx sand x F.Y.M.) | 0.92 | 0.72 |
| **Overall Mean** | **0.69** | **0.59** |
| **F- test** | S | S |
| **S. Ed. (±)** | 0.088 | 0.072 |
| **C. D. (P = 0.05)** | 0.187 | 0.153 |

## CONCLUSION

The influence of the tree species soil was treated in combination T4 (20cm depth soil x sand x F.Y.M.) germination ability shows significant result in all the test crops treatment tomato shows higher capacity than chili. The growth parameters shoot and root length, shoot and root weight and dry matter shows significant result in all the test crops. Maximum suppression was recorded in the treatment with T4 (20cm depth soil x sand x F.Y.M.) soil concentration in all the test crops. Tomato shows best performance that chili in all the concentration.

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