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# Allelopathic Influence of Eucalyptus Globulus L. Leaf Leachates on Growth and Development of Bhendi and Brinjal

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**ABSTRACT**

The present study investigates the growth and development of bhendi (Abelmoschus esculentus L.-cv.CO-1) and brinjal (Solanum melongena L.–cv.MDU-1) under pot culture experiments with different concentrations of aqueous leaf leachates (5%, 10%, 20%, 30% and 50%) of Eucalyptus. Eucalyptus leaf leachates showed an inhibitory and stimulatory effects on germination, seedling length, biomass, pigments and biochemical constituents of bhendi and brinjal. The 5% concentration of leachate stimulated the seed germination, seedling growth and biochemical constituents of bhendi and brinjal . The higher concentrations (10%, 20%, 30% and 50%) showed an inhibitory effects in all the parameters studied in the two economically important vegetable crops. Between bhendi and brinjal, more allelopathic influence was observed in brinjal than bhendi.

**KEYWORDS** Allelopathy, leachates, Eucalyptus, bhendi, brinjal.

## INTRODUCTION

Agroforestry is the integration of Agriculture and Forestry to increase the farm productivity and sustainability of farming systems (Fikreyesus *et al* ., 2011). The agroforestry plants remain productive for the farmers and generate continuous revenue, which is not the case when arable land is exclusively reforested. Agroforestry allows for the diversification of farm activity and makes better use of environmental resources. Farooq *et al*. (2011a) and Bhadoria, (2011) stated that the allelochemicals are mostly secondary metabolities, which are produced as byproducts during different physiological processes in plants. Kurse *et al*. (2000) and Jabran and Farooq (2012) found that the important secondary metabolites identified as allelochemicals are phenols, alkaloids, flavonoids, terpenoids, hydroxamic acids, jasmonates, salicylates, carbonates and aminoacids. At higher concentrations, these allelochemicals may be used as natural pesticides (Farooq *et al*., 2009c). Allelochemicals have great potential of nutrient cycling and nutrient regulation in agro-ecosystems. They offer an eco-friendly and sustsinable way to manage the crop nutrient requirements. Breeding and biotechnology efforts can lead us to the development of genotypes having allelochemicals involved in solublization, transformation, release, mobilization and uptake of essential nutrients. The production of allelochemicals is influenced by age of plant, type of stress, intensity of stress and ambient surroundings.

Plants use secondary metabolites as messenger under suboptimal conditions to trigger the defense mechanism. It starts the production of phytochemicals, hormones, biologically active secondary metabolites and variety of proteins necessary to defend the plant ultra structures from such hazards (Pedrol *et al*., 2006). Under heat, drought or salinity stress, allelochemicals play a vital role in Reactive Oxygen Species (ROS) production initially and then activation of antioxidant defense system (Bogatek and Ginazdoeska, 2007). Adverse effects of abiotic stresses are due to abnormal biological, biochemical, morphological and physiological functions of plants. For instance, soil salinity induces the oxidative stress by the production of ROS causing reduction of photosynthetic electron chain (Waskiewicz *et al*., 2013). Allelochemicals have direct as well as indirect effects on plants. Rizvi *et al*. (1992) stated that the direct action of secondary metabolites is function of different biochemical and physiological changes imparted in growth metabolism of plants.

*Eucalyptus globulus* L. belongs to the family Myrtaceae, mostly found in tropical region. *Eucalyptus* spp. grow under a wide range of climatic and edaphic conditions in their natural habitats (Dawar *et al*., 2007). It has a high potential of allelochemicals and also essential oils . Many studies have revealed that the allelopathic effects of *Eucalyptus* species and conformed the strong inhibitory effects of *Eucalyptus* extracts on some crops (Zhang and Shenglei, 2010; Leela and Arumugam,2014). Leaf extract of eucalyptus inhibited seed germination and reduced root and shoot lengths of cucumber and maximum inhibition was observed in higher concentrations of extract (Allolli and Narayanareddy, 2000). The leaf leachates of *E. globulus* inhibited germination and growth of rice, sorghum and blackgram (Djanaguiraman *et al* ., 2005). Moreover, the extract of *E. globulus* inhibited germination and seedling growth of green gram and cowpea (Djanaguiraman *et al* ., 2002) and black gram (Sasikumar *et al*., 2002: Djanaguiraman *et al* ., 2002). El-Khawas and Shehata (2005) found that leaf extract of *E. globulus* inhibited germination of maize and kidney –bean. The alleleopathic effect of extract from *E. camaldulensis* was tested on tomato; the extract significantly inhibited germination and growth of this plant (Fikreyesus *et al*., 2011) . The present study was conducted to determine the influence of aqueous leaf leachates of *E. globulus* on seed germination , seedling growth, dry weight chl. a, chl. b, total chlorophyll, carotenoids, starch, protein and amino acid contents of bhendi and brinjal.

## MATERIALS AND METHODS

Five hundred gram of senesced fallen leaves of *Eucalyptus globulus* were collected during the month of May from the social forestry of Cuddalore District of Annamalai Nagar (11.45°N 70.45°E) for the present study. These leaves were washed thoroughly with tap water followed by distilled water and soaked in 1000 ml distilled water for 48 hours. These leachates were filtered and filtrates were considered as 50% concentration. The obtained *E. globulus* leaf leachate was analyzed for phytochemical profiles by GC-MS. From this leachates (50%) further dilutions of 5, 10, 20, 30% were prepared using distilled water. The freshly prepared leachates were used for the study.

Healthy uniform seeds of brinjal and bhendi were collected from Tamil Nadu Agricultural University, Coimbatore. The seeds were pre-soaked in distilled water for overnight. Before germination, the seeds were surface sterilized with 0.1% $HgCl_2$ solution for 30 seconds and washed in distilled water thoroughly for several times to remove excess of chemical and dried on absorbent to eliminate fungal attack. Twenty five seeds each of brinjal and bhendi were sown in earthen pots

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(30× 15cm) filled with garden soil having silt, humus and sand (pH -7.3, N – 0.13, P – 0.29, K – 0.09 and OC – 1.86%) Each pot was added with 200 ml of different concentrations of leaf leachates and control was treated with 200 ml of water. The experiment was conducted in completely randomized design with three replications. After 15 days of germination, the morphological and biochemical parameters were studied.

**Table - 1**
Allelopathic Influence of Eucaluyptus globulus leaf leachate on germination (%) of Bhendi and Brinjal.

| Leachate concentrations | Bhendi | Brinjal |
|---|---|---|
| control | 98 | 96 |
| 5% | 100 (2.0) | 99 (3.1) |
| 10% | 96 (-2.0) | 91 (-5.2) |
| 20% | 82 (-16.3) | 78 (-18.8) |
| 30% | 68 (-30.6) | 59 (-38.5) |
| 50% | 47 (-52.0) | 41 (-57.3) |

Data in parentheses indicate % increase/decrease over control.

**Table -2**
**Allelopathic Influence of *Eucaluyptus globulus* leaf leachates on root length(cm/seedling), shoot length(cm/seedling) and dry weight(mg/seedling) of Bhendi and Brinjal.**

| Leachate concentrations | Bhendi | | | Brinjal | | |
|---|---|---|---|---|---|---|
| | Root length | Shoot length | Dry weight | Root length | Shoot length | Dry weight |
| control | 4.5 | 7.65 | 34.2 | 4.15 | 6.52 | 33.12 |
| 5% | 4.64 (3.1) | 7.78 1.7) | 36.9 7.9) | 4.23 1.9) | 6.78 4.0) | 33.3 0.7) |
| 10% | 4.20 (-6.7) | 7.12 (-6.9) | 33.67 (-1.5) | 3.81 (-8.2) | 6.03 (-7.5) | 30.2 (-8.7) |
| 20% | 3.63 (-19.3) | 6.50 (-15.0) | 27.86 (-18.5) | 3.15 (-24.1) | 5.25 (-19.5) | 26.4 (-20.1) |
| 30% | 2.86 (-36.4) | 5.59 (-26.9) | 20.61 (-39.7) | 2.21 (-46.7) | 4.30 (-34.0) | 18.2 (-45.2) |
| 50% | 1.99 (-55.8) | 4.2 (-45.1) | 12.79 (-62.6) | 1.50 (-63.9) | 3.12 (-52.1) | 10.2 (-69.3) |

Data in parentheses indicate % increase/decrease over control.

**Table -3**
**Allelopathic Influence of *Eucaluyptus globulus* leaf leachate on Chl.a, Chl.b and Total chlorophyll and Carotenoids (mg/g fr.wt.) of Bhendi and Brinjal.**

| Leachate concentrations | Bhendi | | | | Brinjal | | | |
|---|---|---|---|---|---|---|---|---|
| | Chl.a | Chl.b | Total Chl. | Carot. | Chl.a | Chl.b | Total Chl. | Carot. |
| control | 1.45 | 1.92 | 3.37 | 0.85 | 1.51 | 1.1 | 2.61 | 0.94 |
| 5% | 1.62 (11.7) | 2.15 (12.0) | 3.77 (11.9 | 0.95 (11.8) | 1.70 (12.6) | 1.2 (9.1) | 2.90 (11.1) | 1.06 (12.8) |
| 10% | 1.42 (-2.1) | 1.90 (-1.0) | 3.32 (-1.5 | 0.80 (-5.9) | 1.37 (-9.3) | 0.97 (-11.8) | 2.34 (-10.3) | 0.90 (-4.3) |
| 20% | 1.15 (-20.7) | 1.68 (-12.5) | 2.83 (-16.0 | 0.67 (-21.2) | 1.18 (-21.9) | 0.85 (-22.7) | 2.03 (-22.2) | 0.78 (-17.0) |
| 30% | **0.8 (-44.8)** | 1.37 (-28.6) | 2.17 (-35.6 | 0.48 (-43.5) | 0.99 (-34.4) | 0.69 (-37.3) | 1.68 -35.6) 35.6 | 0.59 (-37.2) |
| 50% | 0.53 (-63.4) | 0.83 (-56.8) | 1.36 (-59.6 | 0.23 (-72.9) | 0.71 (-53.0) | 0.48 (-56.4) | 1.19 (-54.4) | 0.37 (-60.6) |

Data in parentheses indicates % increase/decrease over control.

**Table -4**
**Allelopathic Influence of *Eucaluyptus globulus* leaf leachates on Starch, Protein and Amino acid (mg/g fr.wt.) of Bhendi and Brinjal.**

| Leachate concentrations | Bhendi | | | Brinjal | | |
|---|---|---|---|---|---|---|
| | Starch | Protein | Aminoacid | Starch | Protein | Aminoacid |
| control | 4.2 | 3.15 | 1.67 | 5.35 | 2.53 | 1.58 |
| 5% | 4.26 (1.4) | 3.21 (1.9) | 1.70 (1.80) | 5.50 (2.8) | 2.57 (1.6) | 1.62 (2.5) |
| 10% | 3.96 (-5.7) | 2.98 (-5.4) | 1.51 (-9.6) | 5.17 (-3.4) | 2.26 (-10.7) | 1.39 (-12.0) |
| 20% | 3.38 (-19.5) | 2.57 (-18.4) | 1.24 (-25.7) | 4.60 (-14.0) | 1.90 (-24.9) | 1.15 (-27.2) |
| 30% | 2.69 (-36.0) | 2.08 (-34.0) | 0.92 (-44.9) | 3.90 (-27.1) | 1.47 (-41.9) | 0.81 (-48.7) |
| 50% | 1.60 (-61.9) | 1.50 (-52.4) | 0.53 (-68.3) | 2.65 (-50.5) | 0.99 (-60.9) | 0.42 (-73.4) |

Data in parentheses indicate % increase/decrease over control.

**Table-5**
**Phytochemical profile of *Eucalyptus globulus* by GC-MS analysis**

| S.No. | Peak name | Retention time | Peak Area | %Peak Area |
|---|---|---|---|---|
| 1 | Name: Propanal, 2-methyl- Formula: $C_4H_8O$ MW: 72 | 2.07 | 4089609 | 0.0453 |
| 2 | Name: 3-Buten-2-ol, 2-methyl- Formula: $C_5H_{10}O$ MW: 86 | 2.42 | 2924459 | 0.0324 |
| 3 | Name: 1-Propanol, 2-methyl- Formula: $C_4H_{10}O$ MW: 74 | 2.55 | 19529378 | 0.2165 |
| 4 | Name: Butanal, 3-methyl- Formula: $C_5H_{10}O$ MW: 86 | 2.83 | 6313655 | 0.0700 |
| 5 | Name: Acetic anhydride Formula: $C_4H_6O_3$ MW: 102 | 2.95 | 661903 | 0.0073 |
| 6 | Name: Formic acid 2-methylpropyl ester Formula: $C_5H_{10}O_2$ MW: 102 | 3.21 | 1389381 | 0.0154 |
| 7 | Name: 1-Butanol, 3-methyl- Formula: $C_5H_{12}O$ MW: 88 | 3.95 | 11043484 | 0.1225 |
| 8 | Name: 2-Pentanone, 3-methyl- Formula: $C_6H_{12}O$ MW: 100 | 4.23 | 342429 | 0.0038 |
| 9 | Name: Propanoic acid, 2-methyl- Formula: $C_4H_8O_2$ MW: 88 | 4.42 | 410324 | 0.0045 |
| 10 | Name: Butanoic acid, 3-methyl-, methyl ester Formula: $C_6H_{12}O_2$ MW: 116 | 4.68 | 488548 | 0.0054 |
| 11 | Name: 1-Butanol, 3-methyl-, formate Formula: $C_6H_{12}O_2$ MW: 116 | 4.97 | 1090580 | 0.0121 |
| 12 | Name: Octane Formula: $C_8H_{18}$ MW: 114 | 5.11 | 275029 | 0.0030 |
| 12 | Name: 3-Penten-2-one, 4-methyl- Formula: $C_6H_{10}O$ MW: 98 | 5.18 | 275924 | 0.0031 |

| | | | | |
|---|---|---|---|---|
| 13 | Name: 3-Heptene, 2,6-dimethyl- Formula: $C_9H_{18}$ MW: 126 | 5.44 | 395989 | 0.0044 |
| 14 | Name: 1,2,4,4-Tetramethylcyclopentene Formula: $C_9H_{16}$ MW: 124 | 6.07 | 1523891 | 0.0169 |
| 15 | Name: Butanoic acid, 3-methyl-, ethyl ester Formula: $C_7H_{14}O_2$ MW: 130 | 6.46 | 599037 | 0.0066 |
| 16 | Name: Butanoic acid, 3-methyl- Formula: $C_5H_{10}O_2$ MW: 102 | 6.81 | 1603202 | 0.0178 |
| 17 | Name: 1-Butanol, 3-methyl-, acetate Formula: $C_7H_{14}O_2$ MW: 130 | 7.07 | 2320452 | 0.0257 |
| 18 | Name: 3-Hepten-2-oneFormula: $C_7H_{12}O$MW: 112 | 7.48 | 69844 | 0.0008 |
| 19 | Name: 3-Buten-2-one, 3-methyl- Formula: $C_5H_8O$ MW: 84 | 7.59 | 83679 | 0.0009 |
| 20 | Name: Nonane Formula: $C_9H_{20}$ MW: 128 | 7.67 | 219555 | 0.0024 |
| 21 | Name: Bicyclo[2.2.1]hept-2-ene, 1,7,7-trimethyl- Formula: $C_{10}H_{16}$ MW: 136 | 7.93 | 108493 | 0.0012 |
| 22 | Name: 1R-à-Pinene Formula: $C_{10}H_{16}$ MW: 136 | 8.88 | 1781909632 | 19.7585 |
| 23 | Name: Camphene Formula: $C_{10}H_{16}$ MW: 136 | 9.32 | 12522426 | 0.1389 |
| 24 | Name: Bicyclo[2.2.1]heptane, 2,2,3-trimethyl- Formula: $C_{10}H_{18}$ MW: 138 | 9.98,10.23 | 232764736 | 2.5810 |
| 25 | Name: 1-Methyl-4-(1-methylethyl)-cyclohexane Formula: $C_{10}H_{20}$ MW: 140 | 10.55 | 10175710 | 0.1128 |
| 26 | Name: Eucalyptol Formula: $C_{10}H_{18}O$ MW: 154 | 12.05 | 6713018368 | 74.4367 |
| 27 | Name: Bicyclo[2.2.1]heptan-2-one, 1,3,3-trimethyl- Formula: $C_{10}H_{16}O$ MW: 152 | 13.63 | 35053400 | 0.3887 |
| 28 | Name:Bicyclo[2.2.1]heptane-2,5-diol, 1,7,7-trimethyl-, (2-endo,5-exo)- Formula: $C_{10}H_{18}O_2$ MW: 170 | 13.96 | 11300221 | 0.1253 |
| 29 | Name: Camphor Formula: $C_{10}H_{16}O$ MW: 152 | 14.17 | 80461744 | 0.8922 |
| 30 | Name: Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-, (1R)- Formula: $C_{10}H_{16}O$ MW: 152 | 14.31 | 538564 | 0.0060 |
| 31 | Name: trans-2-Caren-4-ol Formula: $C_{10}H_{16}O$ MW: 152 | 14.62 | 1296662 | 0.0144 |
| 32 | Name: 3-Cyclopentene-1-acetaldehyde, 2,2,3-trimethyl- Formula: $C_{10}H_{16}O$ MW: 152 | 14.74 | 2078797 | 0.0231 |
| 33 | Name: Limonene oxide, cis- Formula: $C_{10}H_{16}O$ MW: 152 | 14.93 | 1273655 | 0.0141 |
| 34 | Name: trans-Pinocarveol \Formula: $C_{10}H_{16}O$ MW: 152 | 15.29 | 3999162 | 0.0443 |
| 35 | Name: Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-, (1R)- Formula: $C_{10}H_{16}O$ MW: 152 | 15.46 | 62221528 | 0.6899 |
| 36 | Name: Bicyclo[2.2.1]heptan-3-one, 6,6-dimethyl-2-methylene- Formula: $C_{10}H_{14}O$ MW: 150 | 15.90 | 1523430 | 0.0169 |
| 37 | Name: 5,7-Octadien-2-ol, 2,6-dimethyl- Formula: $C_{10}H_{18}O$ MW: 154 | 16.09 | 328308 | 0.0036 |
| 38 | Name: Bicyclo[3.1.0]hexan-2-ol, 2-methyl-5-(1-methylethyl)-, (1à,2à,5à)- \Formula:$C_{10}H_{18}O$MW: 154 | 16.40 | 1417182 | 0.0157 |
| 39 | Name: Benzene, 1-methyl-4-(1-methylethenyl)- Formula: $C_{10}H_{12}$ MW: 132 | 16.59 | 1496496 | 0.0166 |
| 40 | Name: 3-Cyclohexene-1-methanol, à,à4-trimethyl- Formula: $C_{10}H_{18}O$ MW: 154 | 16.82 | 6973628 | 0.0773 |
| 41 | Name: Bicyclo[3.1.1]hept-3-en-2-one, 4,6,6-trimethyl-, (1S)- Formula: $C_{10}H_{14}O$ MW: 150 | 17.27 | 1089280 | 0.0121 |
| 42 | Name: 2-Cyclohexen-1-ol, 2-methyl-5-(1-methylethenyl)- Formula: $C_{10}H_{16}O$ MW: 152 | 17.54,18.25 | 1221333 | 0.0135 |

**RESULTS AND DISCUSSION**

The germination percentage of five different concentrations of leachate (5, 10, 20, 30 and50%) and water (control) is shown in Table:1. The results revealed that the 50% concentration of leachate strongly reduced the germination percentage of brijal and bhendi (57% and 52%) compared to that of 5% leachate (99% and 100%). All concentrations of Eucalyptus leaf leachate did not show the same degree of reducing nature of germination. At 5% leachate concentration the germination percentage increased when compared to control. The inhibition of germination is dependent on the concentration of the leachate which may be due to the entry of water soluble allelochemicals into the seed inhibiting the germination. Suseelamma and Venkataraju,(1994) found that the *Digera muricata* leaf extracts reduced the germination and seedling growth of groundnut.

The Eucalyptus leaf leachate significantly reduced the root length, shoot length and dry weight of bhendi and brinjal at 50% leachate treatment when compared to the control (Table- 2). But at 5% concentration of leachate treatment, the test corps showed the promotory effects on root lenghth, shoot length and dry weight over to control. The highest reduction percentage of shoot length (52.1%) was recorded in brinjal at 50% leachate treatment. Seedling growth of bhendi and brinjal reduced progressively with increasing concentrations of leachate. The more reduction of dry weight of bhendi and brinjal at 50% leachate concentration was 62.6% and 69.3% respectively..The results of present study were similar to those of Malik (2004), El-Khawas and Shehata (2005), Yamagushi *et al*. (2011), Mahmood Dejam *et al*. (2014) who have studied allelopathic effect of *E. globulus* leaf extract on germination and seedling growth of some vegetable and crop plants. Vishal Vijayan (2015) recorded the highest germination percentage in rice, when field soil is mulched with dry leaves of Acacia.

Lowering the concentration of allelochemicals induce more stimulation in plant growth. It improves cell division and cellular regulation under chilling conditions to acclimate the plant roots. Maqbool et al. (2012), found that the *Galinsoga parviflora* water extracts at low concentration improved chilling resistance of *Vicia faba*. Phiri (2010) found that the Moringa water extract increased sorghum germination, maize radical length and hypocotyl length when applied on plant foliage at low concentration. Maqbool *et al*. (2012), reported that low concentrations of allelopathic water extracts as seed treatment before sowing or planting can improve germination percentage, germination power, germination index, radical length, plumule length, fresh weight and dry weight of plants. The inhibition of seedling length and biomass may be due to the presence of higher amount of volatiles, chemicals or phenolic compounds. The present study support the earlier record by del Moral and Muller (1970).

The higher degree of adverse effect was observed in brinjal treated with Eucalyptus 50% concentration of leaf leachate followed by 30, 20, 10 and 5%. The results of GC-MS analysis showed the presence of propanal, butanal, acetic anhydride, formic acid, 2-pentanone, propanoic acid, butanoic acid, eucalyptol, limonene oxide, 1, 2-propanediol, 2-acetate, propanoic acid, methyl ester, phenol, glycerine, butanol, benzofuran, etc. in Eucalyptus.

The chlorophyll-a, chlorophyll-b, total chlorophyll and carotenoid contents under Eucalyptus leaf leachate treatment are given in the Table :3. The highest decreasing percentage of chlorophyll-a, chlorophyll-b, total chlorophyll and carotenoid was noticed at 50% in bhendi and brinjal (63.4%, 56.8%, 59.6%, 72.9%, 53%, 56.4%, 54.4%, 60.6%) when compared with 5%, 10%, 20% , 30% concentration of leaf leachate and control seedlings. In all the leachate treatments, bhendi and brinjal showed more reduction percentage in chlorophyll – a than chlorophyll – b. But in brinjal, less reduction percentage of carotenoid was observed in all treatments compared to bhendi. Decreasing trend on pigment content was recorded in the test crops with increasing concentrations (10, 20,30 and 50%) of leaf leachate of Eucalyptus. The effect might be due to degradation of chlorophyll pigments or reduction in their synthesis and the action of flavanoids, trepenoids or other phytochemicals present in leaf leachate (Tripathi *et al*., 1999, 2000). The more reduction of chlorophyll –a than chlorophyll –b, indicate its susceptibility to stress (Djanaguiraman *et al*., 2003). During stress situation, in tolerant species conversion of chlorophyll –a to chlorophyll –b may occur ((Djanaguiraman *et al*., 2003). At higher concentrations allelochemicals may act as photosynthetic inhibitors which block electron acceptors, act as energy uncouplers and reduce the activity of photosyntheitc pigments and enzymes (Einhellig and Rasmussen, 1979). However, a positive role can be predicted at their lower concentrations. Growth is promoted through optimum $CO_2$ fixation under normal conditions at relatively low concentrations of secondary metabolites.

The highest inhibitory effect was found in brinjal at 50% concentration of Eucalyptus leaf leachate. It may be due to their high concentration of phenol content along with other constituents in the leachates. The phenolic compound might have interference with phosphorylation pathway or inhibiting the activation of $Mg^{2+}$ and ATPase activity or might be due to decreased synthesis of total carbohydrate, protein and nucleic acid (DNA and RNA) or interference in cell division, mineral uptake and biosynthetic processes (Pawar *et al*., 2004). Abu-Romman (2011) reported that photosynthetic pigments in *Capsicum annum* seedlings were significantly and negatively affected by treatment with *Achillea biebersteinni*.

Table 4 shows the starch, protein and amino acid content of the test crops. The higher amount of starch, protein and amino acid were observed in 5% concentration of leachate treated seedlings of bhendi and brinjal over control. When increasing the leaf leachate concentrations (10, 20, 30 and 50%) there was a decreasing trend of starch, protein and amino acid contents both in bhendi and brinjal seedlings. The 50% concentration of leaf leachate showed more retarding effect on amino acid content of test crops than starch and protein. In bhendi, more protein content was observed than starch and amino acid contents in all treatments. But in brinjal more starch content was observed in all treatments than protein and amino acids. As the chlorophyll concentration decrease in all concentration of leachate, the metabolite of starch, protein and amino acid decreased. Tripathi *et al*. (1998), reported that the lower concentration of leaf extracts of *Acacia nilotica*, *Tectona grandis* and *Albiia procera* showed stimulatory effect on starch, protein and amino acid contents of soybean. But in higher concentration of leaf extract, there was a decreasing trend of these biochemical constituents as observed in the soybean (Tripathi *et al*., 1998)

The decreasing content of biochemical contents may be due to action of phyto pinene, camphene, eucalyptol, phenolic aglycons, flavanoids, trans-pinocarveol, limonene oxide, cis, 5,7-octadien-2ol, 2,6- dimethyl, etc. The combination of different phenolic compounds showed a greater inhibition effect than the individual phenolic acids, which is present in the Eucalyptus leaf leachates. The allelochemicals of Eucalyptus significantly reduced the chlorophyll, carotenoid, starch, protein and amino acid contents of leaves. Kohli, (1990) reported, that the enzymes like protease, polyphenol oxidase, peroxidase, α-amylase and α- amylase are affected by the allelochemicals.

**CONCLUSION:**

The present investigation revealed that aqueous leaf leachate of Eucalyptus at different concentration levels inhibited seedling growth and at low concentration (5%) stimulated the germination, seedling length, biomass, pigments, starch, protein and amino acid contents of bhendi and brinjal seedlings. Inhibitory effect of different concentrations of leachate was not equal and highest inhibition was observed in brinjal while the lowest inhibition was observed in bhendi. In both the test crops the promotary effects were observed at 5% concentration of leachate. The inhibitory and stimulatory effects of *E. globulus* leaf leachates on bhendi and brinjal may be due to the presence of allelochemicals in the leachates. Further field study must be carried out to exploite the alleopathic potentiality of Eucalyptus on field crops.

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