



## ECO-FRIENDLY WEED CONTROL BY USING LEACHATES OF EUCALYPTUS

Anita Tomar<sup>1\*</sup>, Dinesh Kumar<sup>2</sup>, Satya Prakash<sup>2</sup> and Anubha Srivastav<sup>1</sup>

<sup>1</sup>Forest Research Centre for Eco-rehabilitation, Prayagraj.

<sup>2</sup>Forest Research Institute, Dehradun.

\*Corresponding Author: Anita Tomar

Forest Research Centre for Eco-rehabilitation, Prayagraj.

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### 1. ABSTRACT

In this study leaf extracts of *Eucalyptus* hybrid, were applied on the nursery beds. Vegetative propagules of *Cyperus rotundus*, *Cynodon dactylon* and *Dactyloctenium aegyptium* were collected and soaked in trays in leaf extracts of *Eucalyptus* hybrid at 0 to 30% concentration for 12 hours. Significant effect was recorded on all these parameters indicating that the leaf leachate of *Eucalyptus* has strong influence on plant percent and growth of these weeds when leaf extract is directly applied on the vegetative propagules of weeds or the plant emerging there from. The effect was more severe when higher concentrations of leaf leachates were used. In control, the performance was usually best or on a par with the best treatment. Sprouting, survival, growth and seed production was significantly reduced in the weed species due to application of aqueous extract of *Eucalyptus* to their vegetative parts. Plant percent was close to sprouting percent indicating that the extracts did not lead to mortality of weed plants. Germination percentage of seed borne on those weed plants was, however, as good as that of seeds borne on untreated plants.

**KEYWORDS:** Eucalyptus, extract, weeds, leaf leachates.

### 2. INTRODUCTION

Weeds are the plants, which grow where they are not wanted.<sup>[1]</sup> Weeds are a serious problem for every nursery manager. Left unmanaged, they can drastically lower plant survival and plant growth. Control of weeds requires huge financial expenditure. Technically, weed is any plant growing out of place, especially one that grows faster than the plants of desired species. Weed invasion in nurseries is exacerbated by application of manures, fertilizers and irrigation. Intensive nursery management requires intensive weed management.<sup>[2]</sup> Some control measures can be biologically or economically effective but unacceptable because of adverse environmental impacts. In India, weeds are one of the major biological constraints that limit crop productivity. They compete with crops for natural and applied resources besides being responsible for reducing quantity and quality of agricultural productivity.<sup>[3-4]</sup> Moreover, weeds compete with crops for the same resources: water; nutrients; light and carbon dioxide.<sup>[5]</sup> The wider the crop rotation, the more efficient the weed control.<sup>[6]</sup> Bhan<sup>[7]</sup> estimated that weeds in India reduce crop yields by 31.5% (22.7% in winter and 36.5% in summer and kharif seasons). In other studies, weeds were reported to cause up to one-third of the total losses in yield, besides impairing quality of produce and causing health and environmental hazards.<sup>[8]</sup> In a survey, Indian weed scientists estimated losses due to weeds from 10% to 100%. Losses of this

magnitude due to weeds may occur in plantation crops, fruits, vegetables, grasslands, forestry and aquatic environments. The total economic losses will be much higher, if indirect effects of weeds on health, losses of biodiversity, nutrient depletion, grain quality, etc. are taken into consideration.<sup>[9]</sup>

Weed problem occurs in nurseries in germination beds, root trainers, polythene bags, nursery beds, along paths, water channels as well as open areas in nursery. FYM is a source of weed seeds and control of weed seeds in FYM itself can considerably reduce weed incidence in nursery.

Numerous reports are available in the literature showing the deleterious effect of leachates of some commercial trees (e.g. *Eucalyptus* hybrid) on germination and growth of different species. Therefore it becomes very pertinent and interesting to use these treatments for positive outcome in terms of control of weeds in the nursery. The present study was carried out with a view to examine this possibility. Need is to develop effective eco-friendly weed control measures.

### 3. METHODOLOGY

The study was carried out in Central Nursery of Forest Research Institute Dehradun located at 30° 19'N latitude and 78°03' E longitude. The survey of nursery was

carried out in different seasons of the year and weeds were recorded. The seasons of sprouting or germination of the weeds was also recorded. Leaf extracts (leachates) were collected from *Eucalyptus* hybrid. The following concentrations viz. 0%, 5%, 10%, 15%, 20%, 25%, 30% of leaf extracts were prepared on fresh weight basis.

The studies were carried out in pots. The plants were regularly irrigated. Unless otherwise stated, the standard cultural practices in nurseries followed in Dehradun region were used. Germination, sprouting and growth data were collected. Germination percentage was calculated as the percentage of seeds that germinated in the experiment. Sprouting percentage was calculated as the percentage of vegetative propagules that sprouted in the experiment. Plant percent was calculated as the percentage of seeds (or sprouts) that developed into plants at the end of experiment. Biomass was estimated on dry weight basis after drying the specimens in hot-air oven at 70°C for 72 hours. Randomised block design with three replications was used in all studies. Vegetative propagules of *Cyperus rotundus*, *Cynodon dactylon* and *Dactyloctenium aegyptium* were collected and soaked in trays in leaf extracts of *Eucalyptus* hybrid at 0 to 30% concentration for 12 hours. The propagules were then sown in pots at rate of 5 propagules/pot. Leaf leachate solutions were applied to the pot at rate of 100 ml/pot. Leaf extract was sprayed on the pots at a rate of 100 ml/pot at 10-day intervals. Germination, growth and biomass of the weed species were studied.

#### 4. RESULTS AND DISCUSSION

The following weeds were found to be most abundant and difficult to control:

- Cyperus rotundus* (motha)
- Dactyloctenium aegyptium* (makda ghas, mandua ghas)
- Cynodon dactylon* (doob)

The results on effect of *Eucalyptus* extract are shown in Table 1 to 8. n

Significant effect was recorded on all these parameters indicating that the leaf leachate of *Eucalyptus* has strong influence on plant percent and growth of these weeds when leaf extract is directly applied on the vegetative propagules of weeds or the plant emerging there from. The effect was more severe when higher concentrations of leaf leachates were used. In control, the performance was usually best or on a par with the best treatment. Sprouting, survival, growth and seed production was significantly reduced in the weed species due to application of aqueous extract of *Eucalyptus* to their vegetative parts. Plant percent was close to sprouting percent indicating that the extracts did not lead to mortality of weed plants. Germination percentage of seed borne on those weed plants was, however, as good as that of seeds borne on untreated plants.

**Table 1. Effect of Pre-sowing Application of Leaf Extract of *Eucalyptus* hybrid on Sprouting (%) of Vegetative Propagules of Important Weeds.**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	96.1	90.2	86.4	79.8	81.6	78.4	70.2
<i>Cynodon dactylon</i>	100	100	96.6	95.2	84.3	88.5	72.5
<i>Dactyloctenium aegyptium</i>	93.8	94.2	93.1	89.7	92	91.6	86.4

CD(5%): 3.22

**Table 2. Effect of Pre-sowing Application of Leaf Extract of *Eucalyptus* hybrid on Time (days) to Initiation of Sprouting of Vegetative Propagules of Important Weeds.**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	9	11.33	13.67	13.67	14.67	14.33	15.33
<i>Cynodon dactylon</i>	10.67	11.33	15	14.67	17.33	17.33	17.33
<i>Dactyloctenium aegyptium</i>	6.33	6	7.67	9.33	10.33	9.67	10.67

**Table 3. Effect of Pre-sowing Application of Leaf Extract of *Eucalyptus* hybrid on Time (days) to Completion of Sprouting of Vegetative Propagules of Important Weeds**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	13.33	16	17.67	17.33	19.33	20	20
<i>Cynodon dactylon</i>	16.67	19.33	23	25	26	25.33	26.67
<i>Dactyloctenium aegyptium</i>	8	10.67	13.33	15.33	15.33	14.67	16.33

CD(5%): 3.24

**Table 4. Plant (%) of Weed Species Produced from Propagules Treated With *Eucalyptus* Leaf Extract**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	89.2	82.1	82.5	76.8	74.6	71.5	70.2
<i>Cynodon dactylon</i>	100	97.7	96	92.6	82.3	84.8	69.9
<i>Dactyloctenium aegyptium</i>	92.6	93.1	90.5	88.4	80	77.3	79.4

CD(5%): 3.06

**Table 5. Mean Height (cm) of Plants of Weed Species Produced from Propagules Treated With *Eucalyptus* Leaf Extract**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	14.5	15.8	13.2	10.2	11.8	9.7	10.1
<i>Cynodon dactylon</i>	21.8	21.5	16.9	15	13.5	13.4	12.9
<i>Dactyloctenium aegyptium</i>	16.2	17	14.6	11.2	12.5	11.3	11.8

CD(5%): 2.81

**Table 6. Mean Biomass (g) per Plant of Weed Species Produced from Vegetative Propagules Treated With *Eucalyptus* Leaf Extract.**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	5.14	5.01	4.06	4.24	3.65	3.23	3.32
<i>Cynodon dactylon</i>	1.56	1.32	1.33	1.11	1.23	1.02	1.1
<i>Dactyloctenium aegyptium</i>	5.75	5.18	4.38	4.4	3.76	3.87	3.57

CD(5%): 0.97

**Table 7. No. of Seeds per Plant of Weed Species Produced from Vegetative Propagules Treated With *Eucalyptus* Leaf Extract.**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	98.4	86.2	77.6	64.5	68.5	63.5	60.3
<i>Dactyloctenium aegyptium</i>	141.2	100.8	111.4	97.4	102.4	99.6	91.8

CD(5%): 15.36

**Table 8. Germination (%) of Weed Species Produced from Propagules Treated With *Eucalyptus* Leaf Extract**

Weed species	<i>Eucalyptus</i> leaf extract concentrations						
	0%	5%	10%	15%	20%	25%	30%
<i>Cyperus rotundus</i>	91.5	88.6	90.1	86.2	88.9	89.8	91.6
<i>Dactyloctenium aegyptium</i>	71.5	73.5	70.8	68.7	73.2	69.4	70.4

CD(5%): 5.54

## 5. CONCLUSION

Soaking of vegetative propagules of *Cyperus rotundus*, *Cynodon dactylon* and *Dactyloctenium aegyptium* in leaf extracts of *Eucalyptus* hybrid, (upto 30% concentration) followed by spraying of the extracts at 10-day intervals resulted in late and reduced sprouting, reduced growth, lower biomass and less seed production in the weed plants, reduction in seed germination, growth and biomass of weed plants.

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