Part 5. Cultural Requirements

Vegetation Management in *Eucalyptus*[1]

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Abstract: Weeds and weed control are a major problem in the growth and management of Eucalyptus trees. Annual, biennial and perennial. weed species are common in sites to be planted. These weeds should be controlled before planting. Preplant, preemergence and postemergence herbicides are discussed. Safe preemergence herbicides include oryzalin, napropamide, oxadiazon, linuron and to a lesser degree simazine, atrazine and diuron. Glyphosate, amino triazole and paraquat have been used safely and efficaceously [sic] postemergence. Combinations of mechanical and chemical weed control help allow maximum tree establishment and growth.

Weeds are plants that compete for water, nutrients and light, or in Eucalyptus plantations may interfere with the management and operations of the growing and harvesting of trees. Weeds when dry may also be a fire hazard. Eucalyptus species are grown in California for wood products, ornamental trees along roadways or around buildings and as an ornamental for cut foliage. This paper will refer principally to the control of weeds prior to, or during the early establishment of trees.

Unwanted vegetation (weeds) are found in all sites that will be considered for planting. The plants found will generally be a mix of material and will represent broadleaf and grass weeds. The weeds will usually be a mixture of annual, biennial and perennial plants. The majority of plants will be annual and will complete their life cycle from seed to foliage, bloom and seed within a year. Plants that germinate in the late winter and spring are called summer annuals because they mature in the summer but die with a frost. When plants start in the cool moist season (fall) and grow through the winter they are called winter annuals.

Biennial plants usually start in the fall and form a rosette during the first winter. They form a flower stalk in the following year, flower, form seed, then die.

The life cycle of the third type of plant is called perennial. They possess the capability of continuing growth year after year. They not only seed but generally will form an above and/or below ground storage organ that helps maintain the stand of the weed. Perennials may be herbaceous johnsongrass (Sorghum halapense), field bindweed (Convolvus arvensis) or California blackberry (Rubus vitifolius).

[1]Presented at the Workshop on Eucalyptus in California, June 14-16, 1983, Sacramento, California.

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TYPES OF CONTROL STRATEGIES

Site selection

The site can be selected to optimize the growth of trees without the interference of unwanted vegetation. Annual weeds though a problem are not as difficult to control as the perennial plants. Sites infested with perennial herbaceous weeds, woody brambles or shrubs should be avoided if possible. Increased costs are required when reducing perennial weed populations. A site that can be cultivated for annual weed control during early tree establishment will reduce chemical costs. A site that has water (irrigation) available allows for controlling moisture for tree growth. The freedom to apply water (time and amount) is beneficial in increasing herbicide efficacy. In an irrigated plantation weed competition for water may not become a limiting factor. In dryland (natural rainfall) sites weeds must be reduced or eliminated to maintain moisture for the trees.

Site Preparation

Weeds should be controlled before planting the trees. Brush species should be removed and resprouting species controlled before planting. Perennial weeds such as bermudagrass, johnsongrass, nutsedge or field bindweed should be reduced before planting. Postemergence herbicides are effective for these weeds. Annual species can be reduced by cultivation followed by an irrigation to germinate new weeds before the second cultivation. A contact herbicide can be substituted for the cultivation.

A cultivation will reduce seed production and subsequent weed infestations. Where erosion can be a concern, mowing the weeds may be more desirable than a cultivation. Mowing weeds promotes low growing (prostrate) species, especially bermudagrass.

Preplant (Aquiar, 1975) and preemergence (Bazan, 1974 and Veiga, 1969) herbicides have been used prior to planting of seedling trees.

Gen. Tech. Rep. PSW-69. Berkeley, CA: Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture; 1983.

Preplant fumigants have been effective and safe. They are expensive for large areas but reasonable for nursery production sites.

Preemergence herbicides (monuron, diuron, simizine and atrazine) have been injurious when applied prior to planting.

Control in New Plantings

The control of weeds is most critical to the growth of trees during the first 2 years after planting. Various control measures (Starr, 1980) were compared on a sandy clay and podsolic soil. Mowing of weeds allowed greater tree growth than no weeding. On a sandy clay soil the best growth resulted from treatment with a black plastic mulch. In the podsolic soil there was no difference in tree growth when treated with black plastic, wood mulch, hand weeding or a combination of paraquat and diaquat. Ramalho and Zunti (1975) in Brazilian plantations reported using mowing at right angles reduced manual labor. Prolonged weedings (Brandi, 1974) were needed to give maximum tree growth.

Preemergence herbicides (table 1) have been evaluated on Eucalyptus species. The tolerances of the species are listed with the reference. Postemergence herbicides (table 2) can be used selectively as a directed spray. These same preemergence and postemergence herbicides have been evaluated in establishing plantings.

In sloping sites where soil erosion occurs it has been observed in pine plantations that a strip treatment of preemergence herbicide down the tree row and leaving vegetation between the rows reduces erosion. The vegetation between the rows should be mowed periodically to reduce moisture loss and to decrease a fire hazard.

Preemergence studies on E. sideroxylon var. rosea (table 3) indicated no significant phytotoxicity or difference in growth with simazine, napropamide, oxadiazon, or combinations of simazine plus trifluralin or oxadiazon plus trifluralin applied annually over a 3-year period.[3] The control of annual weeds was excellent with all treatments (table 4). Similar studies using the same herbicides were conducted in container Grown E. nicholii. Field plantings of E. pulverulenta[4] have been treated with preemergence herbicides (table 5) without phytotoxicity and, in general, good weed control.

Eucalyptus as a Weed Tree

Since some species are very site tolerant, such as moisture, salts, fertility and soil depth, they may be considered weed trees in certain locations. These sites seem to be preferred for pines (Minko, 1981) or in some California Douglas-fir (Pseudotsuga) in some locations, annual crops in others. Eucalyptus found as weed species include E. cambageana, E. largiflorens and E. populnea.

[3]Elmore, C.L. and D. Hamilton. Unpublished data.
[4]Elmore, C.L. and S. Besemer. Unpublished data.

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Table 1--Preemergence herbicides evaluated on Eucalyptus species

Herbicide	Reference	Comments
alachlor	Elmore, 1973	selective
atrazine	Bazan, 1974; Brasil, 1976a; Ethiopia, 1974; Schie, 1978	toxic to seedlings
bromacil	Bazan, 1974; Brasil, 1976a	toxic to seedlings
DCPA	Bazan, 1974; Brasil, 1976b; Elmore, 1973	nontoxic to seed germination
dichlobenil	Flinn, 1979	injured 3 species
diuron	Brasil, 1976a; Veiga, 1969	safe on some species established .
EPTC	Veiga, 1969	safe but short residual
hexazinone	Schie, 1978	toxic to E. globulus
linuron	Bazan, 1974; Brasil, 1976a; Brasil, 1976b; Dorsser 1973	nontoxic to seed germination
monuron	Veiga, 1969	injures plants
napropamide	Elmore, 1973	highly selective
oryzalin	Brasil, 1976b; Elmore, 1973; Starr, 1980	highly selective
oxadiazon	Elmore, 1973	highly selective
propyzamide	Flinn, 1979	selective for grasses
propazine	Flinn, 1979	selective
secbrometon	Bazan, 1974	toxic to seedlings
simazine	Brasil, 1976a; Elmore, 1973; Ethiopia, 1974; Flinn, 1979; Revell, 1976; Schie, 1978	tolerant on most young or established plantings at low rates and in medium to heavy soil
terbumeton	Bazan, 1974	toxic to seedlings
trifluralin,	Elmore, 1973	highly selective

Table 2--Postemergence herbicides evaluated on Eucalyptus species

Herbicide	Reference	Comments
aminotriazole	Magnani, 1976; Schie, 1978	effective grass control when used with atrazine or simazine
dalapon	Veiga, 1969	injurious to E. saligna
glyphosate	Ethiopia, 1974; Starr, 1980	effective postemergence on grasses and some woody species (brambles)
paraquat	Ethiopia, 1974; Revell, 1976	control of young annuals

Table 3--Phytotoxicity and Growth Indices of E. sideroxylon var. rosea

Herbicide	Rate A.I./A	Phytotoxicity[1] 3 MO.	5 MO.*	2 MO.**	Growth[2] Indices
simazine	0.5	0.0	0.0	0.5	299.2
simazine + trifluralin	0.5 + 2	0.0	0.0	0.6	314.7
napropamide	4	0.5	0.0	0.3	334.8
napropamide	16	0.8	0.0	0.0	280.6
oxadiazon	2	0.2	0.0	0.0	289.8
oxadiazon + trifluralin	2 + 2	0.0	0.0	0.0	270.0
untreated	-	0.0	0.0	0.0	282.3 (N.S.)

[1]Phytotoxicity:0 = no effect; 10 = dead plants.

[2]Growth indices = $\frac{\text{height (m) x width (m)}}{2}$ mean of 2 plants per plot x 4 replications.

*Months after 2nd application.

**Months after 3rd application.

Table 4--Weed Control in E. sideroxylon var. rosea [1]

Herbicide	LB. A.I./A	(Months) 3	4	(4)	(5)
simazine	0.5	7.3	6.6	8.4	8.0
simazine + trifluralin	0.5 + 2	6.4	6.8	9.0	9.1
napropamide	4	9.3	8.6	8.6	9.2
napropamide	16	9.6	9.2	9.9	9.9
oxadiazon	2	7.9	7.2	8.5	8.8
oxadiazon + trifluralin	2 + 2	6.7	6.8	9.1	9.0
untreated	--	3.2	4.7	1.8	0.2

[1]Weed control: 0 = no control, 10 = complete control

Applications: 7/23/71, 12/21/71, 11/21/72*, (simazine rate doubled)

Table 5--Preemergence herbicides in field planting of 1 year old E. pulverulenta

Herbicide	LB A.I./A	Weed Control[1] 1 Mo. All Weeds	2 Mo. Cheeseweed	Goosefoot	All Weeds	Phytotoxicity[2] 2 Mo.
simazine	1.0	5.5	8.8	10.0	8.5	1.0
simazine	2.0	7.0	10.0	9.0	9.0	1.0
linuron	0.5	6.5	9.8	5.0	7.8	1.0
linuron	1.0	6.8	9.8	8.2	8.8	1.0
diruon	1.0	6.5	9.8	8.5	8.0	1.0
simazine + oryzalin	1 + 4	7.2	9.0	10.0	9.0	1.0
simazine + napropamide	1 + 4	7.0	9.5	9.8	9.0	1.0
oryzalin	4	6.2	9.8	7.2	7.5	1.0
napropamide	4	5.5	8.0	5.8	7.0	1.0
oxyfluorfen	0.5	9.4	10.0	10.0	8.8	1.0
oxyfluorfen	1.0	8.8	10.0	10.0	9.5	1.0
oxyfluorfen	2.0	9.8	10.0	10.0	9.8	1.0
untreated	-	3.8	3.2	1.0	4.2	1.0

[1]Weed control: 10= complete control; 1 = no control.

[2]Phytotoxicity: 1 = no effect; 10 = dead plants.