

## **Herbicide Program at the PFRA Shelterbelt Centre**

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Abstract -The PFRA Shelterbelt Centre is a major supplier of conservation tree and shrub planting stock in Canada. Testing of herbicides for nursery weed control has been under way for over thirty years. The result of this research has been the development of a comprehensive herbicide program that has supplemented conventional weed control methods that has significantly reduced nursery labour requirements. Herbicides currently used operationally are linuron for poplar and willow cuttings, choke cherry and green ash sowings, conifer transplants, all 1-0 deciduous crops and nursery shelterbelts; sethoxydim for barnyard grass control in conifer transplants; and trifluralin for caragana and Siberian elm sowings. Herbicide treatments being tested for operational use include: oxyfluorfen for conifer sowings; napropamide for villosa lilac sowings; trifluralin for buffaloberry and sea-buckthorn sowings; trifluralin/metribuzin tank mix for pre-emergent weed control in shelterbelts; and clopyralid for control of Canada thistle in shelterbelts.

### **INTRODUCTION**

The Prairie Farm Rehabilitation Administration (PFRA) Shelterbelt Centre at Indian Head, Saskatchewan was established in 1902. The Centre is located at Indian Head, Saskatchewan and occupies an area of 640 acres. Current production ranges from 8 to 10 million tree seedlings annually. Seedlings are used for farmstead and field shelterbelts, wildlife habitat, reclamation and agroforestry plantings. Currently the Centre produces four coniferous and 22 deciduous species. Since its inception in 1902 the Centre has distributed over 500 million tree seedlings to prairie tree planters.

Fifty years ago the Shelterbelt Centre established a research unit that conducted studies on nursery practice, tree breeding, and pest control in addition to providing technical support to nursery production operations. The unit has undergone several changes over the years. Its current mandate is to solve problems associated with growing trees on the prairies and more recently to investigate tree related activities that have a role in sustainable rural development. Research is being conducted in the following disciplines: tree improvement, propagation, entomology, weed control, pathology, agroforestry and shelterbelt effects. Along with the research mandate the section remains responsible for overseeing most technical operations at the Centre. This includes herbicide, insecticide, fungicide, fumigant, defoliant and fertilizer applications.

The Shelterbelt Centre has a long history of herbicide research. The program was initiated through a need to establish herbicide recommendations that could safely be used in nursery crops. Weed control is an important factor in nursery production. Prior to the use of

herbicides considerable labour was required for weed control. Alspach (1988) reported that herbicides reduced the labour requirement for weed control in Siberian elm sowings by 92 percent and poplar cutting beds by 63 percent. This paper outlines herbicide practices currently in use at the PFRA Shelterbelt Centre.

### **SEEDBED FUMIGATION**

Conifer seedbeds are routinely fumigated using dazomet. Dazomet (Basamid 98% granular) is applied to seedbeds using an applicator designed and fabricated at the Shelterbelt Centre. The applicator applies the dazomet at 425 kg/ha and incorporates to a depth of 20 centimetres in one operation. The seedbeds are irrigated daily for five to seven days following application. After the necessary treatment time has elapsed the soil is rotovated to allow any remaining gases to dissipate. Dazomet is currently used for disease and weed control in white spruce (*Picea glauca* (Moench) Voss), Colorado spruce (*Picea pungens* Engelm.), Scots pine (*Pinus sylvestris* L.) and Siberian larch (*Larix sibirica* Ledeb.) seedbeds as well as deciduous shrub seedbeds.

### **CONIFER SEEDBEDS**

Conifers grown at the Shelterbelt Centre include white spruce, Colorado spruce, Scots pine and Siberian larch. White spruce and Siberian larch are fall sown whereas Scots pine and Colorado spruce are spring sown. Oxyfluorfen (Goal 19% EQ) is applied at 2.6 litres product per hectare (38 oz/ acre) immediately after sowing white spruce, Colorado spruce and Scots pine. This treatment is applied before conifer or weed emergence. The herbicide is incorporated with light irrigation (0.5 centimetres) following application.

### **CONIFER TRANSPLANTS**

Conifers are transplanted in beds after two years in seedbeds. Transplanting is carried out during June using modified celery transplanters. Weed control is provided by linuron application at 4.7 litres product (48% Liquid Suspension) per hectare (68 oz/acre) immediately after transplanting when seedlings are dormant. The herbicide is incorporated by light irrigation (0.5 centimetres). In the fall, linuron is applied at a rate of 3.5 litres product per hectare (50 oz/ac) as an overall spray when seedlings are dormant. This treatment provides residual weed control in the following growing season. Barnyard grass (*Echinochloa crusgalli*) is controlled by applying sethoxydim (Poast 18% EC) at 1.0 litres of product per hectare (14 oz./ acre). For optimum control the barnyard grass should be in the 2-3 leaf stage and irrigation must not be applied within one hour of herbicide application.

### **POPLAR AND WILLOW HARDWOOD CUTTINGS**

Poplar and willow hardwood cuttings are rooted in nursery fields. Cuttings are planted in late May using a mechanical planter developed at the Shelterbelt Centre (Schroeder 1984). Following planting but before budbreak, linuron (48% Liquid Suspension) is applied at a rate of 3.5 litres of product per hectare (50 oz/acre). The herbicide is incorporated using light irrigation (0.5 centimetres).

### **DECIDUOUS TREES AND SHRUBS**

The Shelterbelt Centre currently produces 18 deciduous species. Major species include caragana (*Caragana arborescens*), green ash (*Fraxinus pennsylvanica*), choke cherry

(*Prunus virginiana*), villosa lilac (*Syringa villosa*), Siberian elm (*Ulmus pumila*), Manitoba maple (*Acer negundo*), silver buffaloberry (*Shepherdia argentea*) and sea buckthorn (*Hippophae rhamnoides*). All species except for caragana, Manitoba maple and Siberian elm are fall sown. These species are spring sown and germinate soon after sowing. Western snowberry (*Symphoricarpos occidentalis*) and Arnold hawthorn (*Crataegus amoldiana*) are summer sown and do not germinate until the following spring.

Caragana and Siberian elm are sown in late spring. Prior to sowing, fields receive a pre-seeding treatment of trifluralin (Treflan 48% EQ at a rate of 2.35 litres product per hectare (33 oz/acre) in 18 gallons of water per acre. The herbicide is applied no more than seven days prior to sowing and incorporated to a depth of 8 to 10 centimetres (3 to 4 inches) with a tandem disc.

Choke cherry and green ash are sown in late fall. Occasionally stratified seed will be sown in the spring. Linuron (48% Liquid Suspension) is applied immediately after sowing at rate of 3.5 litres of product per hectare (50 oz/acre). Precipitation during the fall and winter provide incorporation of the herbicide. For spring applications the herbicide is incorporated with a light irrigation (0.5 centimetres).

Testing of herbicides for weed control in villosa lilac has been under way for many years with little success. The most promising treatment appears to be application of napropamide (Devrinol 50% WP) prior to sowing lilac. The recommended application rate is 5.0 kilogram of product per hectare (70 oz./acre) followed by incorporation to a depth of 5 centimetres.

Summer sown species such as snowberry and hawthorn require weed control prior to germination the following spring. This is accomplished with applications of paraquat (Gramoxone 20% solution) at a rate of 5.6 litres of product per hectare (80 oz/acre). Paraquat application is repeated as often as required, prior to shrub emergence.

Most deciduous species are in nursery fields for two years. Weed control during the second growing season is provided by application of linuron the previous fall. Linuron is applied as an overall spray at a rate of 3.5 litres product per hectare (50 oz./ acre) to fields of dormant seedlings. This treatment is particularly effective for control of winter annuals such as flixweed (*Descurainia sophia*), stinkweed (*Thlaspi arvense*) and shepherd's-purse (*Capsella bursa-pastoris*).

## **CHEMICAL DEFOLIATION**

Late defoliation of Siberian elm, villosa lilac and willow species delays nursery lifting operations. Lifting of these species prior to defoliation often results in proliferation of mould during winter storage. Defoliation of Siberian elm can be initiated by application of a tank mix of ethephon (Cerone 48% SN) at 3.4 litres of product plus potassium iodide (KI) at 1.62 kilograms in 90 gallons of water per acre. Thorough coverage of foliage is important. An operating pressure of 100 PSI is maintained while spraying. The defoliation of willow and villosa lilac requires application of ethephon (Cerone 48% SN) at 1.86 litres of product per acre plus endothal (Des-i-cate 6.2% SN) at 14.4 litres per acre. Seedlings can be safely defoliated once they are vegetatively mature. Vegetative maturity is determined by removing

the terminal bud on a seedling and monitoring the development of lateral buds for seven days. When mature, the lateral buds remain dormant. Within two weeks of chemical application leaves turn brown and seedlings defoliate.

### **NURSERY SHELTERBELTS**

Nursery fields are separated by shelterbelts. These tree rows provide microclimate modification and also are used as seed sources for nursery production. Weed control is necessary in these tree rows so that tree growth is maximized and the hedges do not become a source of weed seed that will infest adjacent nursery fields. Prior to planting new shelterbelts a tank mix of 5.2 litres product per hectare of trifluralin (Treflan 48% EC and 600 millilitres product per hectare of metribuzin (Sencor 50% Liquid Suspension) is applied. After application the herbicide is incorporated to a depth of 8 centimetres using a tandem disc. This treatment is currently being evaluated. Results to date indicate there is little to no toxicity to most tree and shrub species. Each fall linuron is applied to tree rows at a rate of 5.0 litres product per hectare (70 oz./acre).

For Canada thistle (*Cirsium a-rvense*) control a directed application of glyphosate (Roundup 36% Solution) is used. The herbicide is applied avoiding contact with tree foliage as contact can cause severe damage. An alternative treatment being tested is clopyralid (Central 36% EC at a rate of 0.8 litres product per hectare (12 oz./acre) applied as an overall spray. Caragana and other legumes are very sensitive to clopyralid, most other tree and shrubs species are tolerant.

### **CONCLUSION**

Weed control practices at the PFRA Shelterbelt Centre have been described. The use of herbicides has significantly reduced labour requirements for nursery production of tree and shrub species. New herbicide treatments are routinely being evaluated to increase the weed control options available to the nursery. Registration of new treatments is a long process requiring many years of testing. This process is essential, however, to ensure the safe and effective use of herbicides.

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