

TIMING OF CHOPPER HERBICIDE SITE PREPARATION RELATIVE TO BEDDING IN THE ESTABLISHMENT OF LOWER COASTAL PLAIN PINE PLANTATIONS

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Abstract—The timing of Chopper® (BASF Corporation, Research Triangle Park, NC) herbicide applications before and after bedding was examined at four Lower Coastal Plain locations. Two bedding regimes, mid-season and late-season, were included at each location. Mid-season bedding occurred between May and July and late-season bedding between September and November. No post-plant herbaceous weed control treatments were included in this study series. Results indicate that many of the historical timing limitations placed on Chopper applications are not necessary. Woody vegetation control was achieved by all application dates, but lesser control was achieved by applications made when target vegetation was dormant or by applications made within 3 weeks after bedding. There was no need to allow vegetation to fully resprout after bedding to achieve control. Herbaceous control the year after treatment was better for applications made at least several weeks after mid-season bedding and applications made before late-season bedding.

INTRODUCTION

Lower Coastal Plain sites have a diverse vegetation complex of waxy-leaved evergreen shrubs, deciduous trees, grasses, broadleaf herbs, and other herbaceous species that compete aggressively with planted pines (Miller and others 2003, Shiver and others 1990). These sites are usually bedded before planting. Bedding consists of plowing soil into a continuous raised mound to create a non-saturated condition for planted seedlings. Bedding also disturbs established woody and herbaceous vegetation. The objective of this study series was to develop management guidelines on how best to time operational applications of Chopper® (BASF Corporation, Research Triangle Park, NC) herbicide with bedding operations. These guidelines are intended to help managers improve the productivity of their forest operations.

Herbicide applications after bedding are usually made after August and after woody vegetation has resprouted on beds. This timing was developed from previous work with triclopyr and glyphosate. These herbicides depend on foliar uptake and provide better control of woody vegetation with late-season applications (Kline and others 1994, Minoque 1985). Timing may not be as critical with Chopper herbicide because it has both foliar and soil activity. However, late-season Chopper applications are favored because they are thought to improve residual control of herbaceous weeds during the first pine growing season.

Herbicide applications before bedding target developed woody plants before disturbance by the bedding plow. Guidelines for herbicide applications were to allow 4 weeks between application and bedding to allow time for the herbicide to translocate before disturbance. Herbicide timing limitations can be difficult to execute because both bedding and herbicide applications can be limited by weather conditions and contractor availability. In 2001, BASF Corporation in cooperation with private industrial timber companies initiated a regional study to investigate the need for these historical timing limitations.

METHODS

Study Design

The designed experiment included two bedding timings, mid-season and late-season, at each location. Timing of herbicide applications were replicated within each bedding regime with applications made as early as February and as late as November. Pre-bedding herbicide treatments were made up to the day before bedding; post-bedding treatments occurred as soon as the day of bedding. Since the primary objective was to assess the impact of Chopper site preparation treatments, no post-plant herbaceous weed control treatments were used.

Locations and Bedding

Four locations were selected to cover a range of soil conditions and vegetation complexes. Vegetation at the two locations with sandy surface soils was dominated by gallberry [*Ilex glabra* (L.) Gray], bluestem grasses (*Andropogon* spp.), and low panicgrass (*Dichanthelium* spp.). Two locations with finer-textured soils had vegetation characterized by a wider range of species, including arborescent hardwoods. Major species at the Whiteville location included red maple (*Acer rubrum* L.), sweetgum (*Liquidambar styraciflua* L.), sweetbay (*Magnolia virginiana* L.), sweet pepperbush (*Clethra alnifolia* L.), titi (*Cyrilla racemiflora* L.), fetterbush [*Lyonia lucida* (Lam.) Koch], and tall panic grasses (*Panicum* spp.). Major species at the Oakdale location included sweetgum, Chinese tallow-tree [*Sapium sebiferum* (L.) Roxb.], American beautyberry (*Callicarpa americana* L.), St. John's wort (*Hypericum cistifolium* Lam.), waxmyrtle (*Myrica cerifera* L.), sumac (*Rhus* spp.), swamp sunflower (*Helianthus angustifolius* L.), dogfennel [*Eupatorium capillifolium* (Lam.) Small], and purple Mecardonia [*Mecardonia acuminata* (Walter) Small.]. Grasses and sedges were also present at Oakdale. Redroot [*Lachnanthes caroliniana* (Lam.) Dandy], a broadleaf herb, was present on parts of both the Yulee and Whiteville locations. Blackberry (*Rubus* spp.) was present to some extent at all locations but was more common at Oakdale.

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Table 1—Bedding and planting dates for each location in 2001

Location	Mid-season bed date	Late-season bed date
Tennille, FL	May 23	November 1
Yulee, FL	June 7	November 19
Oakdale, LA	July 25	September 27
Whiteville, NC	June 22	October 23

Each location was split with half receiving mid-season bedding and the other half receiving late-season bedding. Bedding dates were determined by contractor availability and soil moisture levels and thus differed by location. Mid-season bedding occurred between May 23 and July 25. Late-season bedding occurred between September 25 and November 19 (table 1). Pines were planted in winter following the site preparation treatments.

Herbicide Treatments

The herbicide treatment was 48 ounces per acre Chopper with 5 quarts per acre methylated seed oil (MSO) applied at a total mix volume of 10 gallons per acre. Garlon 4® (Dow Agrosciences) was included at 32 ounces per acre at 3 locations and 16 ounces per acre at 1 location. Herbicide treatments were applied using a backpack pole sprayer equipped with a single KLC-9 nozzle (Spraying Systems Co.). Treatment plots were 60 feet long and 2 beds wide. An untreated bed was included as buffer between treatment plots.

There were between seven and nine herbicide application timings for each bedding regime at each location. Application timings were selected so that applications were made throughout the season, with more applications occurring close to the time of bedding. Initial target dates were similar for all locations, but dates were modified as needed to accommodate environmental constraints. The most restrictive factor was high soil moisture delaying bedding.

Assessments

Woody and herbaceous vegetation cover was assessed in June of the first pine growing season. Woody cover included trees, shrubs, blackberry, and vines. Competition measurement plots (CMPs) were 50 feet long and centered in the treatment plot. Vegetation cover was assessed on two bed CMPs and one inter-bed CMP with the exception of the Tennille location where only bed CMPs were assessed because the bed spacing was close enough to preclude a meaningful inter-bed assessment.

Statistical Analysis

A statistical analysis of total vegetation cover and woody vegetation cover was performed for each bedding regime at each location. This analysis compared the check to Chopper treatments, compared the before- and after-bed treatments, and tested for trends with application timing both before and after bedding. Effects were considered significant at the 5 percent level.

RESULTS

Total vegetation cover in June of the first year after treatment was significantly reduced by Chopper applications at all four locations regardless of application timing or bedding regime. There were, however, differences among application timings for specific bedding regimes. Significant differences varied by location but indicated general trends observed under a wide range of conditions. Vegetation control was related to seasonality of the treatment as well as timing relative to bedding.

Mid-Season Bedding

The relationship between Chopper timing and mid-season bedding is summarized in figure 1 as an average of results observed at four locations. After-bed applications provided better control of herbaceous vegetation than before-bed applications. Applications early in the growing season (February or early March) provided poorer control of deciduous woody species and some herbaceous species. Chopper applications made up to the day before bedding provided excellent control of woody competitors. Applications made between 0 to 3 weeks after bedding provided poorer vegetation control compared to later timings. It is interesting to note that applications just after bedding improved woody vegetation control compared to the untreated check, but control was not as complete as later applications; and that applications made just several weeks after bedding achieved excellent control even though vegetation was scattered and sparse at time of application.

Late-Season Bedding

The general patterns of vegetation control with late-season bedding, summarized in figure 2, were that all Chopper treatments significantly reduced competing vegetation relative to the untreated check. Before-bed applications were more effective than after-bed treatments. Applications made in February and March were not as effective as those made later. Both these early applications and late growing season after-bed applications provided poorer control of herbaceous and deciduous woody vegetation. Chopper treatments applied

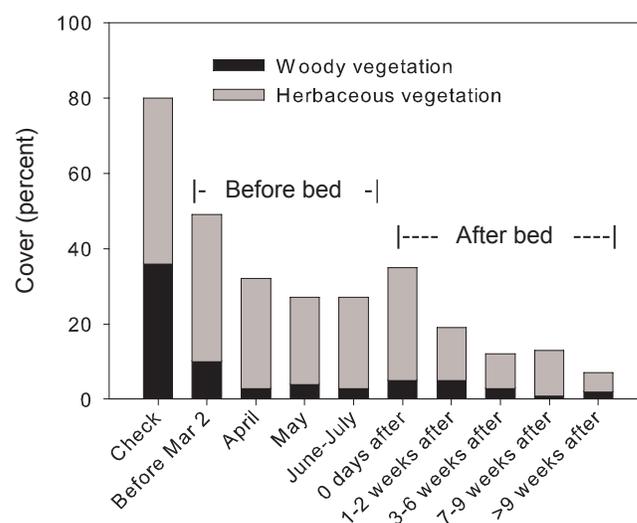


Figure 1—Average woody and herbaceous cover in June the year after treatment for Chopper timings combined with mid-season bedding. Cover is by application month for applications made before bedding and by timing for applications made after bedding.

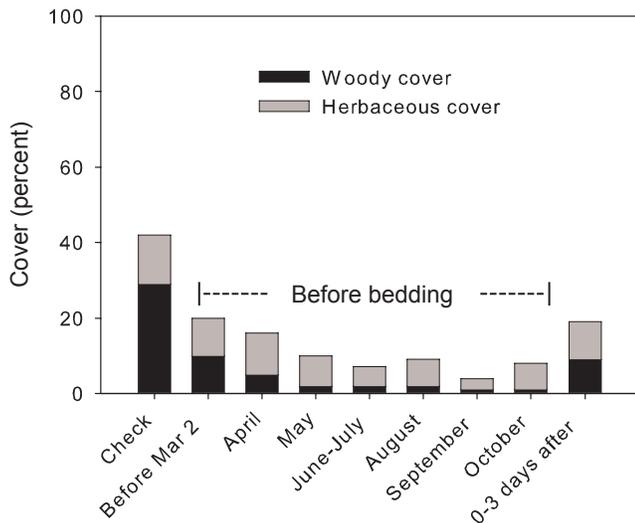


Figure 2—Average woody and herbaceous cover in June the year after treatment for Chopper timings combined with late-season bedding. Cover is by application month for applications made before bedding and by timing for applications made after bedding.

within a few days of bedding (including the day before) controlled woody vegetation.

It is also noteworthy that total cover in June of the first year after treatment was generally lower for late-season bedding than mid-season bedding. A comparison of the bed-only check plots indicates that late-season bedding reduced competition relative to mid-season bedding. The generally lower cover on all treatments following late bedding is due to the late tillage that retarded colonization of mainly herbaceous vegetation the year after treatment.

VEGETATION CONTROL RECOMMENDATIONS

The historical limitations on timing of Chopper applications combined with bedding were found to have little basis in actual treatment performance. All Chopper timings improved

control of vegetation and may be acceptable under specific operational circumstances. However, woody and herbaceous vegetation control can be improved by following these recommendations:

Mid-Season Bed (May-July)

For after bed applications, make applications at least 3 weeks after bedding. Additional post-plant herbaceous weed control may not be necessary with this application timing, particularly on sandy soils.

For before bed application, make applications from February up until the time of bedding and follow with post-plant herbaceous weed control for improved herbaceous control. On sites with deciduous species such as blackberry and hardwood trees, delay application until these species have leafed out.

Late-Season Bed (September-November)

Avoid applications soon after late-season bedding. Make before-bed applications from February up to the day of bedding. On sites with deciduous species such as blackberry and hardwood trees, delay application until these species have leafed out and make applications before leaf-drop at the end of the growing season. Herbaceous weed control may not be necessary with late-season bedding, particularly on sandy soils.

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