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Interseeding Alfalfa in Bermudagrass Sod

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Alfalfa is a very productive and high-quality forage but is seldom grown in the South due to uncertainty of establishment or persistence. Producers are reluctant to risk planting a forage with potentially low persistence in place of other more persistent forages. Bermudagrass is one of the most dominant forages in the South and has excellent yield and stand persistence. Disadvantages of bermudagrass are lack of cool-season growth and low quality during late summer. Winter annual forages are commonly interseeded into bermudagrass sods to lengthen the productive season of a particular field and to provide high-quality winter and spring forage. Traditionally, bermudagrass and alfalfa have not been considered compatible in mixed stands, but research work has shown good potential for this mixture. In Texas, alfalfa was successfully drilled into existing bermudagrass sod during the fall (Haby et al., 1999). Studies from South Carolina showed that alfalfa drilled into bermudagrass improved forage yield, but bermudagrass vigor was severely reduced (Stringer et al., 1994). Arkansas studies have shown that improved methods for interseeding alfalfa into bermudagrass can lower the risk of production losses and may increase use of alfalfa in livestock operations.

No-till planting alfalfa in bermudagrass sod can be a successful establishment method. Some important advantages of this system are (1) alfalfa does not need nitrogen fertilizer like bermudagrass so N fertilizer costs are reduced, (2) the underlying bermuda sod is not killed, which reduces production risk if the alfalfa establishment fails or the alfalfa stand thins prematurely, and (3) alfalfa production can take advantage of high soil phosphorus and/or potassium on sites with historical applications of poultry litter or biosolids, lowering total fertilizer costs.

Why Alfalfa in Bermudagrass Works

Alfalfa is one of the highest quality forages and produces multiple harvests starting in late April lasting through September. Bermudagrass is a very persistent and productive warm-season forage that starts active growth in late spring. Both forages can be very productive on sites with a history of poultry litter or biosolids applications because of the high accumulated soil fertility.

Cool-season forages like alfalfa can readily be established in bermudagrass sod by interseeding in the fall when the bermudagrass is going dormant. One characteristic of bermudagrass that makes this practice feasible is its low tolerance to heavy shade. Alfalfa begins growth in early spring before bermudagrass breaks dormancy. The heavy shade of the spring alfalfa canopy stunts the bermudagrass. The bermudagrass sod may need up to two weeks for vigorous growth to resume after the shade is removed. Alfalfa begins growing quickly after the first harvest and again produces a canopy before the bermudagrass can recover from the initial spring shading. The bermudagrass remains suppressed during the entire growing season from repeated shading by each successive growth of the alfalfa. University of Arkansas research has documented alfalfa persisting for eight years after interseeding in bermudagrass sod. The bermudagrass stand coverage remained at levels of 5%-10% which is sufficient to re-cover the field as the alfalfa stand thins over time.

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The Establishment Process

Alfalfa stands do not thicken in a field over time as some other forages can, so establishment of a thick, vigorous stand is critical. Planting date, bermudagrass sod management and seeding rate are considerations when planting alfalfa into bermuda. Alfalfa is adapted to deep, well-drained soil. However, it can be grown on rocky soils as long as there are no shallow solid rock layers restricting rooting depth. Refer to FSA15*, Establishing Alfalfa for Forage,* for details on site selection. Soil test the field to determine if soil fertility is adequate for alfalfa. Soil pH should be 6.5+, soil P should be at least 60 lbs/acre and soil K should be at least 250 lbs/acre for vigorous establishment. Nutrient deficiencies should be corrected prior to planting to help ensure excellent establishment. Select a variety adapted to local conditions based on winter dormancy rating and decide if a standard variety or Roundup Ready® variety will be planted.

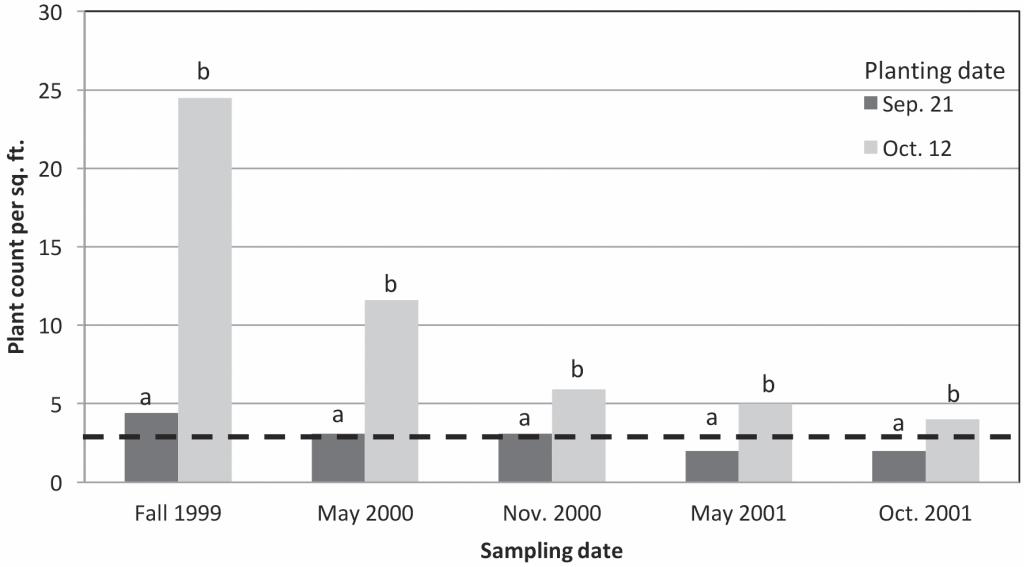
Planting Date and Sod Management

Bermudagrass growth slows quickly in fall when night temperatures drop into the lower 50s and stops when night temperatures drop into the 40s. Timing the alfalfa planting date to coincide with this period is advantageous because of reduced competition from the bermudagrass. Studies showed that October planting at Fayetteville was more successful than September planting (Figures 1 and 2). Alfalfa plant counts and stems counts per square foot were higher for alfalfa planted in October (Figures 3 and 4). Selection of a Roundup Ready® alfalfa

Figure 1. Alfalfa planted in October 1999 into 2-inch bermudagrass stubble. Photo June 2002.

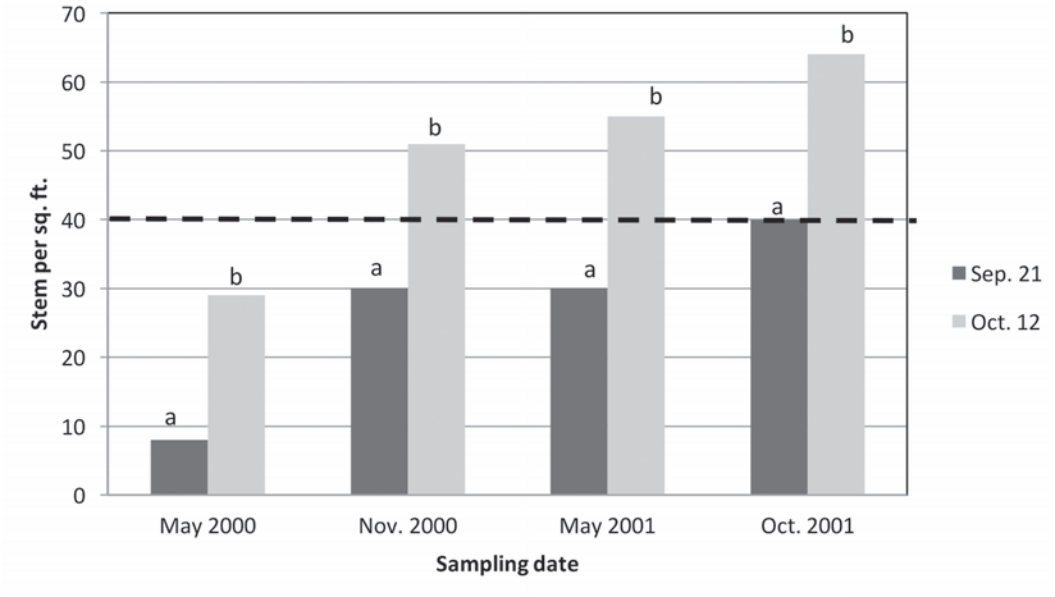
Figure 2. Alfalfa planted in September 1999 into 3.5-inch bermudagrass stubble. Photo June 2002.

Figure 3. Effect of September or October planting date on plant count of alfalfa for the first and second year after planting in bermudagrass sod at Fayetteville, Arkansas – 1999.



Bars within a sampling date topped by the same letter are not significantly different at the 5% level. Dashed line indicates 3 plants per square foot considered a minimum stand recommended for maintaining production.

Figure 4. Effect of September or October planting date on stem count of alfalfa for the first and second year after planting in bermudagrass sod at Fayetteville, Arkansas – 1999.

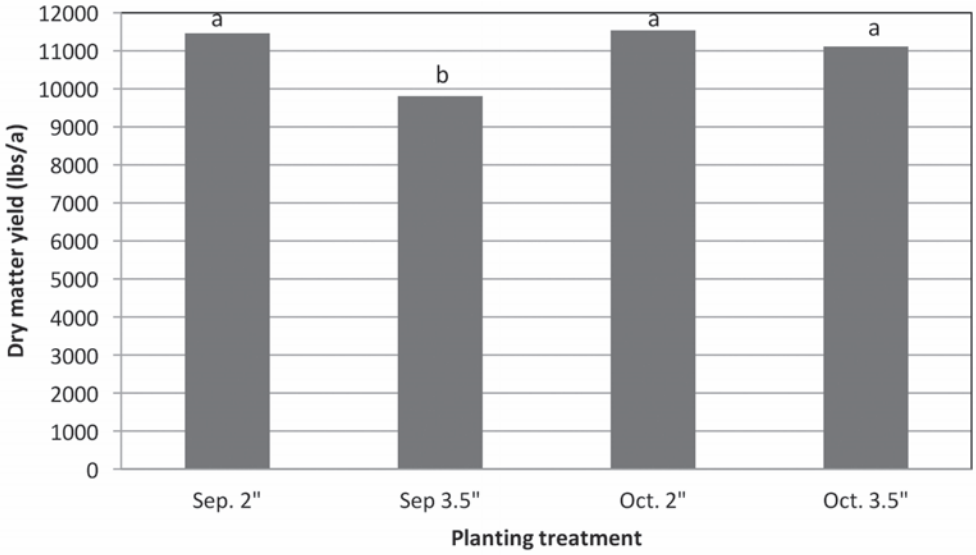


Bars within a sampling date topped by the same letter are not significantly different at the 5% level. Dashed line indicates 40 stems per square foot considered for optimum production.

variety could allow earlier planting if bermudagrass sod is suppressed with glyphosate before planting. Roundup Ready® alfalfa demonstrations planted in September in Cleveland County were successful when bermudagrass was suppressed with glyphosate prior to planting.

The bermudagrass sod should be mowed to a 2-inch stubble prior to interseeding alfalfa. Arkansas studies showed that bermuda stubble height at planting tended to influence alfalfa dry matter (DM) yield. Alfalfa planted in September into 3.5-inch bermuda stubble had significantly lower yield than that planted in 2-inch stubble in September or into 2- or 3.5-inch stubble in October (Figure 5). Weed control is very important during the fall establishment phase and in the spring following planting. Winter annual weeds such as ryegrass, henbit, chickweed and little barley can severely reduce stands if left uncontrolled. Herbicide options depend on the alfalfa type selected, whether standard alfalfa or Roundup Ready® alfalfa.

Figure 5. Total mean dry matter yield over two years of alfalfa planted in two bermudagrass stubble heights on two dates.



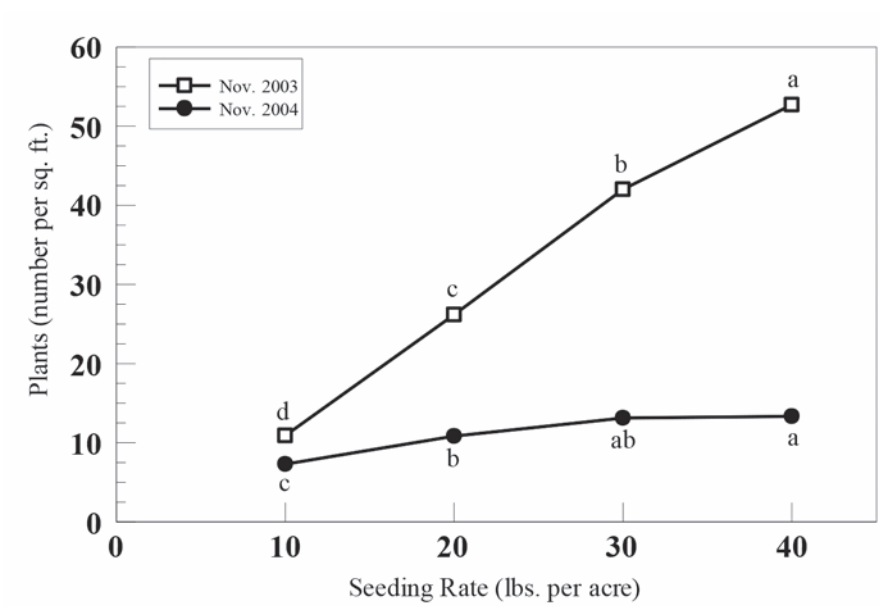
Bars topped by the same letter are not significantly different at the 5% level.

Seeding Rate

Initial studies in Arkansas were planted at 18-20 lbs per acre with mixed success. A 20 lb per acre seeding rate is the standard recommendation for planting alfalfa in a tilled seedbed. Later seeding rate studies were conducted in which alfalfa was seeded into mowed bermudagrass sod at 10, 20, 30 and 40 lbs per acre in October of 2003 and 2004 at the Forage Research Farm at Fayetteville. Alfalfa plant counts were generally lower ($P<0.05$) for the 10 lb seeding rate and highest for the 30 and 40 lb rates (Figure 6). Percent alfalfa coverage in the row in 2005 ranged from 33% to 48% for the 10 lb rate but was greater than 70% for the 30 and 40 lb seeding rates. Alfalfa seedling density one month after planting increased linearly with increasing seeding rate from 10 lb to 40 lb per acre (Figure 6). The 10 lb rate had only 42% of the seedling density of the standard 20 lb rate while the 30 and 40 lb rates had 160% and 200%, respectively, of the seedling density of the 20 lb rate. Plant density still increased linearly from 10 to 30 lbs per acre one year after seeding, but the one-year counts were markedly lower than initial seedling count for all but the 10 lb per acre rate (Figure 6). Thinning alfalfa plant population after planting is normal as remaining plants increase in crown size to fill available space. Plant density one year after planting was highest for the 40 lb per acre rate, but the 30 lb rate was not different from the 20 lb rate. The 10 lb per acre rate had the lowest plant density.

Although differences in plant and stem density occurred, there was no consistent effect of seeding rate on DM yield. Yield was generally not different among treatments except for the first and last harvest of the 2004 seeding when yield was highest for the 30 lb seeding rate. First year total DM yield across all seeding rates ranged from 12,475 to 15,403 lbs per acre for the 2003 seeding and 5,602 to 6,907 lbs per acre for the 2004 seeding. The lack of differences in DM yield suggests that the alfalfa plants and existing bermudagrass compensated at the lower alfalfa seeding rates even though no N fertilizer was applied. Results suggest an optimum alfalfa seeding rate of 20 to 30 lbs per acre. Alfalfa stand persistence is highly dependent on plant population, so planting management for high seedling establishment and high plant survival will favor longer alfalfa stand life. Rates above 20 lbs per acre may improve plant and stem density for longer potential stand persistence. Calibrate planters to deliver 20-30 lbs seed per acre. Set the drill to plant no more than ¼-inch deep. Planting too deep will lead to establishment failure. Refer to FSA3111, *Calibrating Drills and Broadcast Planters for Small-Seeded Forages*, for proper calibration methods.

Figure 6. 2004 plant density of alfalfa sod-seeded into bermudagrass sod at four seeding rates. Alfalfa was planted in October of 2003. *Different letters next to data points indicate significant differences at the 0.05 level within a date.*



Management

First harvest of the alfalfa should be made at early bloom to mid-bloom. This normally occurs in late April to early May. Allowing the first cut to reach mid-bloom creates more shading of the bermuda, thus reducing its competitiveness with the alfalfa. Each cutting will usually reach early bloom and be ready for harvest on 30-day intervals following the first harvest. Fertility is very important for maintaining alfalfa stands. Alfalfa hay removes approximately a 0-15-50 rate of N-P_2O_5-K_2O per ton of DM. Low potash will cause premature stand thinning and low yield. Maintaining adequate soil fertility is crucial for stand health and persistence. Boron should be applied at 1-2 lbs/acre each year. When submitting soil samples, ask for Crop Code 101, "Alfalfa Establishment," for establishment fertilizer and lime recommendations and Crop Codes 102-105, "Alfalfa Maintenance," for hay production recommendations.

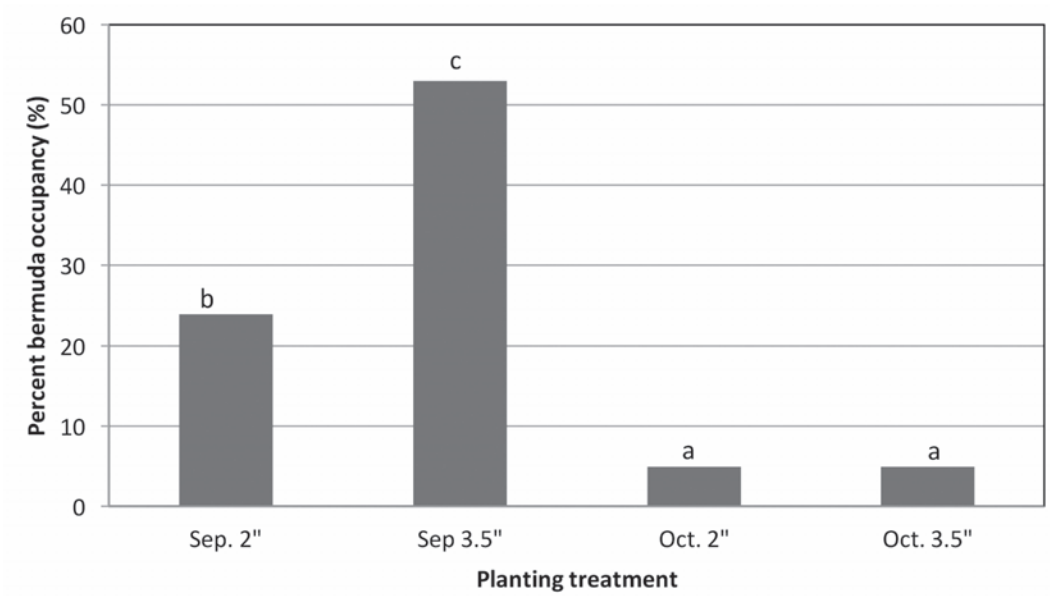
Bermudagrass Survival

Shading from the alfalfa will suppress bermudagrass growth, but enough bermudagrass will remain to repopulate the field when the alfalfa stand thins over time. In the seeding date/stubble height study and in the seeding rate studies, bermudagrass stand was suppressed in all treatments.

In the seeding date/stubble height study, visual estimates of percent alfalfa canopy after first and second cutting were greatest for plots planted in October. By the second cutting, alfalfa canopy averaged 80% in the October-planted plots and increased to near 100% by the third harvest. Percent canopy cover for both harvests was greater for alfalfa planted into 2-inch bermudagrass stubble compared to alfalfa planted into 3.5-inch stubble. Percent bermudagrass remaining was evaluated after 2 years (Figure 7). Survival of bermuda was at least 5% for the October planting and ranged from 25% to over 50% for the September planting in which the alfalfa stand was less dense.

Bermudagrass survival was evaluated for the seeding rate studies in November 2007. Bermudagrass stands remained at 10%-20% in alfalfa planted in 2003 (4 years) and remained at 20%-40% stand in alfalfa seeded in 2004 (3 years). This indicates that even though alfalfa dramatically suppresses bermudagrass growth, enough bermudagrass remains to repopulate the field when the alfalfa declines.

Figure 7. Percent bermudagrass stand remaining two years after alfalfa was planted in two bermudagrass stubble heights on two dates.



Bars topped by the same letter are not significantly different at the 5% level.

Summary

Basic steps for successful interseeding alfalfa into bermudagrass sod and a suggested timeline for each are shown in Table 1.

Table 1. Suggested timeline of practices for successful legume establishment in grass sod.

Suggested Timeline	Management Practice
NOTE: Alfalfa should be drilled into bermudagrass in late September to early October. Plan the following practices based on that schedule.	
6 to 12 months prior to planting	Assess weed pressure and weed species. Start controlling any weed problems in the field where alfalfa will be planted. Preventing weeds from producing seed to reduce the seed bank in the soil is important. Use non-residual herbicides to prevent damage to alfalfa establishment.
6 to 12 months prior to planting	Soil-test the field and apply lime and begin fertility adjustments as needed. **Request Crop Code 101, "Alfalfa Establishment," for fertilizer and lime recommendations at planting and Crop Codes 102-105, "Alfalfa Maintenance," for hay production recommendations.** Low fertility is a common cause of poor alfalfa stands.
6 to 12 months prior to planting	Select a variety adapted to the location in the state based on **winter dormancy ratings**. Also consider whether to grow standard or Roundup Ready® varieties.
2 to 3 months prior to planting	Work with the local agricultural supplier to ensure seed of the desired variety is on hand at planting time.
1 month to 1 week prior to planting	Graze or clip grass to leave a sod stubble height of 2 inches on the day of planting. Planting into excessive grass residue and thatch results in poor establishment.
1 month to 1 week prior to planting	Select the no-till drill to be used, make repairs and calibrate for the proper seeding rate. **If using rented planting equipment, plan time to clean it from prior users and to get it in working order.**
Day of planting	Planting date will be late September to early October. Finish drill calibration and set it to plant at the proper depth. Set the drill to plant about ¼-inch deep. **The most common cause of stand failure is planting too deep.**
After planting	Scout for insect pests and weeds. If using Roundup Ready® varieties, plan to spray glyphosate within 6 weeks after emergence to clean out any seedlings not having the RR trait. Watch for chickweed, henbit, ryegrass and little barley infestation and control as needed.
For stand maintenance	Scout for alfalfa weevil in March/April. Fertilize as directed by soil test in early spring and after second harvest. Harvest when alfalfa reaches 1/10 to ¼ bloom in spring. Plan successive harvests for every 30 days.

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