

# Seeding Month and Seed Soaking Affect Buffalograss Establishment

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Additional index words. *Buchloë dactyloides*

**Abstract.** Field studies were conducted in consecutive years to evaluate the influence of seeding month and seed soaking on buffalograss [*Buchloë dactyloides* (Nutt.) Engelm.] establishment, as measured by percentage of coverage and seedling emergence. In 1991, plots where 'Sharp's Improved' buffalograss burrs were seeded in May, June, or July exhibited complete coverage 7 weeks after seeding (WAS). Between Apr. and Sept. 1992, mean high and low temperatures were  $\approx 3\text{C}$  cooler than in 1991, and seeding in June or July resulted in  $>95\%$  coverage 9 WAS. In the same year, seeding in April or May required 12 to 13 weeks for complete coverage. Buffalograss seeded in August exhibited  $<25\%$  coverage by the end of the first growing season. Soaking buffalograss burrs in water before seeding resulted in the emergence of  $>30\%$  more seedlings 2 WAS compared with nonsoaked burrs and increased coverage by up to 18% on selected rating dates 3 to 13 WAS. However, complete coverage occurred only  $\approx 1$  week sooner where soaked vs. nonsoaked burrs were planted.

Buffalograss is a stoloniferous warm-season grass native to the U.S. Great Plains. It is drought resistant, has a low water-use rate (Feldhake et al., 1983), and is a popular turf in areas where irrigation is limited or impossible. Buffalograss is dioecious, and female plants produce burrs near the soil surface. These burrs contain 4 or 5 seeds each.

Although buffalograss is used extensively in the Great Plains, little information exists on its establishment from seed. Burrs generally are distributed over the seedbed during establishment. Germination can be slow due to a growth-inhibiting oil in the burr (Ahring and Todd, 1977). Buffalograss typically is seeded between April and August in Kansas, but the optimum seeding month has not been determined. In Colorado (Falkenberg, 1982), buffalograss was seeded at 19 to 268  $\text{kg}\cdot\text{ha}^{-1}$  in May, July, and September to determine the effects of seeding month and rate on establishment. Burrs seeded at 190  $\text{kg}\cdot\text{ha}^{-1}$  in May exhibited nearly 60% coverage 9 weeks after seeding (WAS) in an area under natural precipitation only. Burrs seeded in May produced significantly more stolons than those seeded later.

Because poor germination can slow buffalograss establishment, there is interest in evaluating techniques that may enhance germination. Wenger (1941) observed that soaking buffalograss seeds in tap water for up to 4 days and thoroughly drying them before seeding improved germination. The effects of seed

soaking on buffalograss establishment have not been reported. The objectives of this research were to 1) identify the optimum seeding month(s) for buffalograss in Kansas and 2) evaluate the efficacy of seed soaking to hasten buffalograss establishment.

Separate studies were done at the Rocky Ford Turfgrass Research Center in Manhattan, Kan., during 1991 and 1992. Soil type was a Chase silt loam (fine, montmorillonitic, mesic, Aquic, Arquidolls), pH was 6.5, P was 200  $\text{kg}\cdot\text{ha}^{-1}$ , and K was 907  $\text{kg}\cdot\text{ha}^{-1}$ . Treated 'Sharp's Improved' buffalograss burrs were used. Burrs were soaked by the seed distributor in a 0.5% potassium nitrate solution for 24 h, chilled in a wet environment at 5C for 6 weeks, and dried for 24 h.

Our studies evaluated the influence of four or five seeding dates and two seed soaking treatments on buffalograss establishment. Burrs were soaked (Treatment 1) in addition to the soaking done by the distributor or not soaked further (Treatment 2). Treatment 1 was applied as follows: 1) on day 1, burrs were placed in a cotton bag, submerged in water for 6 h, and drained; 2) the cotton bag was covered with plastic after soaking to ensure moisture retention; 3) on days 2 and 3, bags containing burrs were submerged until bubbling ceased and then were removed and drained, and 4) on day 4, burrs were removed from the cotton bag and allowed to air dry by spreading them on white paper.

In 1991, buffalograss burrs were broadcast by hand at 159  $\text{kg}\cdot\text{ha}^{-1}$  on 10 May, 7 June, 10 July, and 8 Aug. Burr application rate was reduced to 49  $\text{kg}\cdot\text{ha}^{-1}$  in 1992 to evaluate the effect of a lower seeding rate on stand establishment; seeding dates were 13 Apr., 15 May, 12 June, 16 July, and 14 Aug. Before seeding the burrs, the seedbed was rototilled to 10 cm deep and raked level by hand. Nitrogen from Milorganite [Milwaukee Metropolitan Sewerage District] (6N-1P-0K) was applied at 49

$\text{kg}\cdot\text{ha}^{-1}$  before seeding. The matric potential of the top 5 cm of soil was maintained at about -30 kPa during the study by rainfall or irrigation. Plots were mowed weekly to maintain a turf height of 6 cm, beginning when plants exceeded this height. Clippings were returned to the plots.

Average monthly air maxima and minima in 1991 were as follows: April, 21 and 8C; May, 27 and 14C; June, 32 and 19C; July, 35 and 20C; August, 34 and 18C; September, 29 and 14C. In 1992, they were as follows: April, 20 and 5C; May, 25 and 11C; June, 27 and 14C; July, 31 and 18C; August, 29 and 16C; September, 28 and 13C.

Seeding date (four in 1991, five in 1992) and seed soaking treatments (two) were arranged factorially in a randomized complete-block design with three replications. Plots measured  $1 \times 2$  m. Analysis of variance was used to determine significant ( $P \leq 0.05$ ) effects. When significant differences were observed, means were separated using the Waller-Duncan Bayesian K ratio *t* test ( $K = 100$ ,  $P \leq 0.05$ ).

6-Chloro-N-N'-diethyl-1,3,5-triazine-2,4-diamine (simazine) was applied at 0.6  $\text{kg}\cdot\text{ha}^{-1}$  to suppress weeds in Apr. 1991 before seeding; in 1992, weeds were removed manually as they appeared. Data were collected on buffalograss emergence and coverage. Between seeding and 2 WAS in 1991 and 3 WAS in 1992, emergence was determined weekly by randomly tossing a  $30 \times 30$ -cm template three times per plot and counting seedlings. Buffalograss coverage was rated visually using a 0% to 100% scale each week beginning 3 WAS and ending 7 WAS in 1991. In 1992, coverage was rated between 4 and 13 WAS. No data were collected for the August seeding date after 7 WAS in 1992 because low temperatures prevented buffalograss establishment.

Main effects of seeding month and soaking treatment were significant for buffalograss emergence and coverage on most rating dates in both years (Table 1). On selected dates each year, the month  $\times$  soaking treatment interaction was significant. This result occurred due to the greater influence of soaking on buffalograss germination and coverage when it was seeded during June and July, when temperatures were warmer and more conducive to growth, than in April and May, when temperatures were lower.

In 1991, buffalograss coverage was  $>95\%$  7 WAS in all plots except those seeded in August (Fig. 1A). An air mean of 23C and a high seeding rate (159  $\text{kg}\cdot\text{ha}^{-1}$ ) encouraged rapid buffalograss coverage. At 3 to 5 WAS, buffalograss seeded in July consistently exhibited coverage equal to or greater than that of buffalograss seeded in May or June. By 6 WAS, there were no differences among seeding months, except August, for buffalograss coverage. At 7 WAS, only 28% coverage was observed in August-seeded plots.

More time was required for buffalograss establishment in 1992 than 1991 because mean air temperatures were  $\approx 3\text{C}$  lower and seeding rate was lower (49  $\text{kg}\cdot\text{ha}^{-1}$ ). Buffalograss

Received for publication 23 Nov. 1992. Accepted for publication 12 Apr. 1993. Kansas Agricultural Experiment Station contribution no. 93-197-J. We thank Sharp Bros. Seed Co., Healy, Kan., for providing seed. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

Table 1. Analysis of variance for buffalograss emergence (E) and coverage (C) as affected by seed soaking and seeding month when evaluated 1 to 7 weeks after seeding (WAS) in 1991 and 1 to 13 WAS in 1992 at Manhattan, Kan.

Effect	1991							1992													
	E		C					-	E		C										
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11	12	13	
Seed soaking (S)	***	***	***	***	***	**	NS	***	***	**	***	**	***	***	**	**	NS	NS	**	**	
Seeding month (M)	***	***	***	***	***	***	***	***	***	***	***	***	**	***	***	***	***	***	***	***	
S × M	NS	NS	**	**	*	NS	NS	***	**	NS	**	NS	NS	NS	NS	NS	NS	NS	**	**	

NS, \*\*\*, \*\* Nonsignificant or significant at  $P \leq 0.05$ , 0.01, or 0.001, respectively.

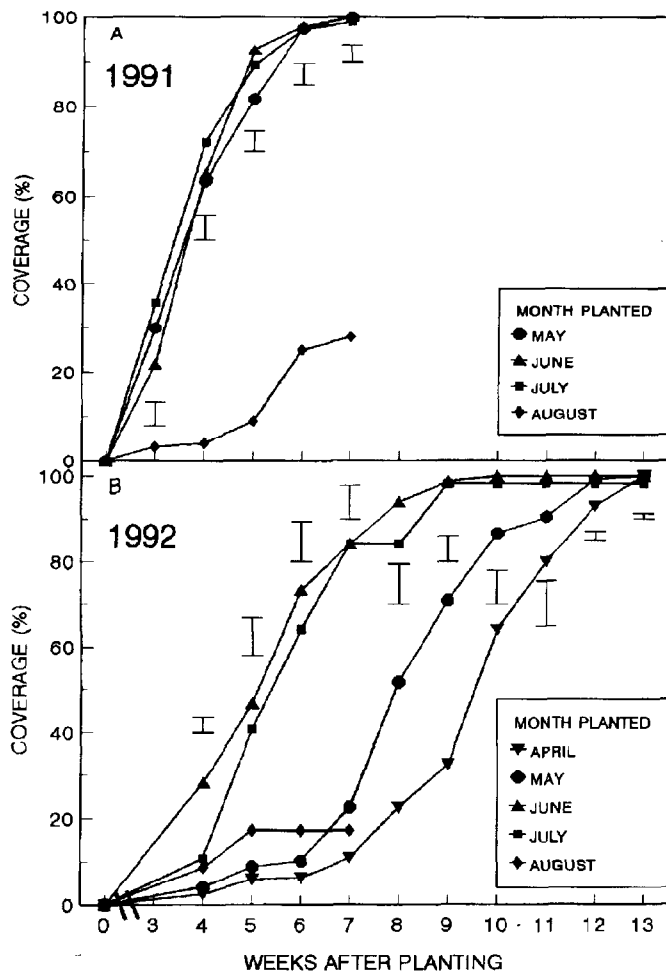


Fig. 1. Effect of seeding month on buffalograss coverage in 1991 (A) and 1992 (B) at Manhattan, Kan. Points represent the mean of two observations of three replications. Bars indicate the minimum significant difference by the Waller-Duncan Bayesian K ratio  $t$  test ( $K = 100$ ,  $P \leq 0.05$ ).

seeded in April, May, June, or July exhibited >95% coverage by 13 WAS (Fig. 1B). Plots that were seeded in June or July attained >95% coverage by 9 WAS; whereas those seeded in April or May required 12 or 13 weeks to achieve >95% coverage. Buffalograss seeded in August exhibited only 17% coverage by the first frost (6 WAS).

Plots seeded in August contained  $\approx 70\%$  fewer seedlings 2 WAS than those seeded in other months (data not shown). This result suggests that seeds sown in August either are

slower to germinate or do not germinate at all. Reasons for reduced germination in August have not been determined. Falkenberg (1982) observed little difference in emergence 1 to 3 WAS between buffalograss seeded in May or September.

In Kansas, >95% buffalograss coverage is possible in one season in irrigated, weed-free areas by seeding between mid-April and mid-July. Coverage was most rapid if buffalograss was seeded in June or July. Burrs seeded in August germinated poorly and ex-

hibited <25% coverage each year. Limited coverage in August-seeded plots was due primarily to the short time between seeding and the first frost, when buffalograss growth ceases. Falkenberg (1982) observed poor growth the initial year of September-seeded buffalograss in Colorado; however, good coverage was noted at the end of the second growing season. For successful buffalograss establishment in one season in Kansas, August seeding is not recommended.

In 1991, buffalograss seedling emergence was 33% higher 2 WAS in plots where soaked seeds (Treatment 1) were planted than in those that received no additional soaking (Treatment 2) (data not shown). Coverage 3 to 6 WAS was 6% to 18% greater in plots seeded to soaked compared with nonsoaked seeds. By 7 WAS, there were no differences in coverage between soaking treatments.

Two weeks after seeding in 1992, 53% more seedlings were present in plots where soaked seeds were planted (data not shown). Between 4 and 13 WAS, buffalograss coverage was 1% to 15% greater in plots where soaked seeds were planted; however, differences in coverage between soaked and nonsoaked treatments were not statistically different at 10 or 11 WAS.

Soaking (Treatment 1) buffalograss burrs encouraged more rapid coverage by hastening and improving seed germination and apparently lessened the effect of a growth-inhibiting oil in the buffalograss burr (Ahring and Todd, 1977). However, time to complete buffalograss coverage was reduced by no more than 1 week, regardless of seeding month. The small increase in establishment that results from soaking buffalograss burrs does not seem to justify the time and labor required to perform the task.

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