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"Burn Down" Management of Winter Cereal Cover Crops for No-tillage Burley Tobacco Production

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INTRODUCTION

Recent developments in the design of no-till transplanters and significant improvements in weed control have made no-till tobacco production a feasible option for burley tobacco growers. No-till production reduces soil erosion when tobacco is grown on sloping land. This helps maintain the long term productivity of the soil and may provide the grower with more options for crop rotation, by allowing sloping land to be utilized for tobacco production.

In addition to less erosion, no-till tobacco provides other advantages including soil moisture conservation, time and fuel savings, improved timeliness of field operations, and cleaner cured leaf.

Unlike corn, wheat, or soybean, tobacco does not produce significant amounts of crop residue that remain on the soil surface following harvest. For this reason, a cover crop should be planted following tobacco harvest to protect the soil during the winter months. Typically, a winter cereal crop, such as winter wheat or rye, is used for this purpose.

Weed control in no-till tobacco was inconsistent prior to the labeling of Spartan. Earlier research suggested that allowing the winter cover crop to make as much growth as possible would improve weed control due to the mulch effect of the cover crop residue (Shilling et al., 1986). While heavier residues may improve weed control, they can interfere with transplanting and make stand establishment more difficult. Straw from mature small grain cover crops may also immobilize plant available nitrogen (Ditsch and Alley, 1991).

Since consistent weed control is now possible with the appropriate use of labeled herbicides, there may be less need for extremely heavy residues. The objective of this study was to examine the effect of herbicidal "burn down" timing on the early season growth and yield of no-till burley tobacco.

MATERIALS AND METHODS

Field studies were conducted at the Spindletop Research Farm (near Lexington, Ky) and at the Robinson Station Farm (near Jackson, Ky) in 1999 and 2000. In the fall preceding each of the growing seasons winter wheat (variety unknown) at a rate of 1.5 bushels/A was seeded following conventional tobacco at the Spindletop location. At the Robinson location, winter rye (variety unknown) was seeded into a prepared seedbed at a rate of 1.5 bushels/A.

The cover crops were "burned down" in the spring at three different times with either Roundup® (3 pt/A [1.5 lbs. ai/A] + 1% crop oil) or Gramoxone Extra® (3pt./A [0.94 lbs. ai/A]+ 0.25% X-77 surfactant). The first treatment was approximately 30 days before transplanting, the second 15 days before transplanting, and the third was the day before transplanting. Two treatments were also included in which an initial treatment was made with either Roundup® or Gramoxone® 30 days prior to transplanting followed by a second treatment with Gramoxone® the day before transplanting to burn down any re-growth that may have occurred.

The day before transplanting at both locations the entire plot area was sprayed with a mixture of Spartan® 75DF at 8 oz./A and Prowl® 3.3EC at 2 pt/A for residual weed control in 1999. In 2000 a mixture of Spartan® 4F at 10 fluid oz./A and Command® 3 ME at 1 pt/A was applied one day before transplanting.

All plots were fertilized according to soil test recommendation for P and K and with 300 lbs N/A. All fertilizers were broadcast applied to the soil surface prior to transplanting. Float tobacco transplants (Var. NC-3 at Spindletop; Var. TN 90 at Robinson) were set using a modified carousel transplanter.

Tobacco stand counts were made, and plant vigor was visually rated on a scale of 1 (indicating poor growth) to 5 (indicating excellent growth), approximately 4 weeks after transplanting. The plots were topped, harvested and cured normally, and cured leaf yields were determined.

RESULTS AND DISCUSSION

Both herbicides produced acceptable "burn down" of the existing small grain vegetation at all three application times. Gramoxone® Extra resulted in more rapid desiccation of the cover crop, with results generally visible in less than a day. However, some regrowth was observed when Gramoxone® Extra was applied 30 days before transplanting. Volunteer wheat or rye was not a problem in any of the treatment combinations in this study.

Heavy residues in plots treated the day before transplanting often became entangled around the shank and shoe of the transplanter forcing a stop so that the plant material could be cleared. Few transplanting problems were encountered in plots that had been burned down 30 days before transplanting. Despite the difficulties, excellent stands were achieved in all but the 1999 Spindletop location (Figure 1).

Stand reductions of approximately 70% were observed in the one day before transplant treatments at the 1999 Spindletop location. The plants initially survived, but later died. Examination of the dead plants revealed that they were cutoff at the soil line. It was speculated that the cover crop was infested with armyworms at the time of spraying, and these worms moved from the dying wheat to feed on the tender tobacco transplants. However no armyworms were found at the time the damage was discovered

Tobacco growth was rated visually as a vigor index approximately four weeks after transplanting. The results clearly showed a reduction in plant vigor with delayed "burn down" time (Figure 2). Tobacco in plots that had been burned down the day before transplanting were smaller and had a lighter green color as compared to plants in plots that had been burned down 30 days before transplanting. Vigor ratings at the 2000 Robinson location were inconsistent due to heavy rains in May and June (Table 1).

Cured leaf yields varied widely between locations and years (Figure 3). At the 1999 Spindletop location all cured leaf yields were very low due to a severe drought. Only one half of the normal growing season (April – September) rainfall occurred at this location (Table 1). There was a significant reduction in cured leaf yields if the burn down treatment was delayed (Figure 3). Part of the yield decline can be explained by the loss of transplants discussed above.

Table 1. Monthly rainfall (inches) at Robinson and Spindletop research farms.

Month	Robinson			Spindletop		
	1999	2000	Normal	1999	2000	Normal
January	4.85	2.25	3.29	5.64	3.48	2.86
February	2.63	3.12	3.60	2.32	4.97	3.21
March	2.84	2.16	4.34	3.27	3.47	4.40
April	3.06	4.55	4.10	1.87	4.10	3.88
May	2.95	7.79	4.48	1.35	2.96	4.47
June	3.07	8.86	3.82	3.89	3.22	3.66
July	4.56	4.16	5.25	2.73	3.42	5.00
August	5.20	6.20	4.01	1.31	3.38	3.93
September	1.08	3.84	3.52	1.03	5.47	3.20
October	2.43	0.43	2.91	1.91	0.92	2.57
November	2.75	1.11	3.88	1.70	1.59	3.66
December	2.67	4.41	4.14	2.44	3.01	3.98
Year	38.09	48.88	47.34	29.46	39.99	44.82
Growing Season	19.92	35.4	25.18	12.18	22.55	24.14

Rainfall at the Robinson location in 1999 was nearly 8 inches more than at Spindletop, and yields were much higher. Even under these relatively favorable conditions there was a trend toward lower yields when the burn down treatment was delayed. No significant yield differences were observed between Gramoxone® and Roundup® as the burn down agent at either location.

Favorable rainfall during the 2000 growing season at Spindletop resulted in good cured-leaf yields. The trend toward lower yields when the burn down was delayed was also evident in 2000. Delaying burn down until the day before transplanting reduced cured-leaf yield by approximately 300 lbs./A (Figure 3).

An extremely wet season at the Robinson location reduced yields and masked any treatment differences. More than 16 inches

of rain in May and June severely stunted growth in many plots due to saturated soil conditions.

CONCLUSIONS

Cover crop management is just one of the keys to successful no-till tobacco production. A winter cereal cover crop that is allowed to grow and mature can remove large quantities of water and nutrients from the soil. This has been observed to reduce the yield potential of double crop soybeans (Pearce et al. 1993). Mature winter cereal straws have also been shown to immobilize plant available nitrogen (Ditsch and Alley, 1991), which might explain the pale green color of tobacco plants in the later "burn-down" plots. Additionally, a growing cover crop has the potential to harbor damaging populations of insect pests.

This study demonstrated that delaying the "burn down" of the cover crop resulted in a significant reduction in early season growth of tobacco that led to a yield decrease. Growers interested in trying no-till tobacco should plan on burning down the cover crop or other existing vegetation at least 30 days before transplanting. The "burn down" should occur prior to heading in the case of winter small grains. Early "burn down" conserves soil moisture and nutrients, allows time for the residue to begin to decompose, reduces planting problems, and will improve early growth of the tobacco.

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The results presented in this paper do not constitute a recommendation. Where trade names are used, no endorsement is intended nor criticism implied of similar products not named. Always read and follow all label directions before using any pesticide.

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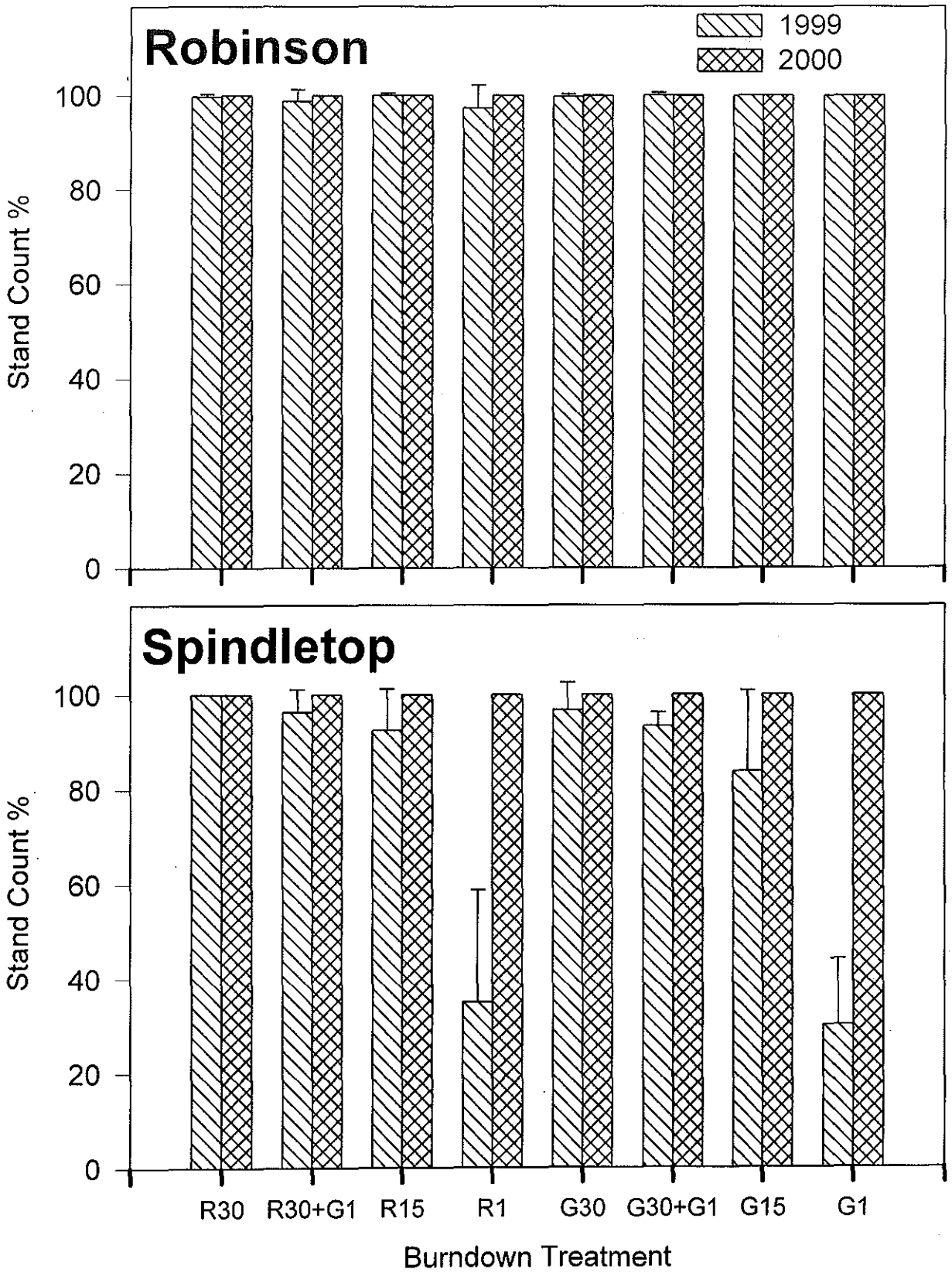

Figure 1. Stand count (% of transplants living) four weeks after transplanting as influenced by time of burn down and chemical used. Error bars represent the standard deviation of the mean. (R = Roundup; G = Gramoxone; number = days before planting.)

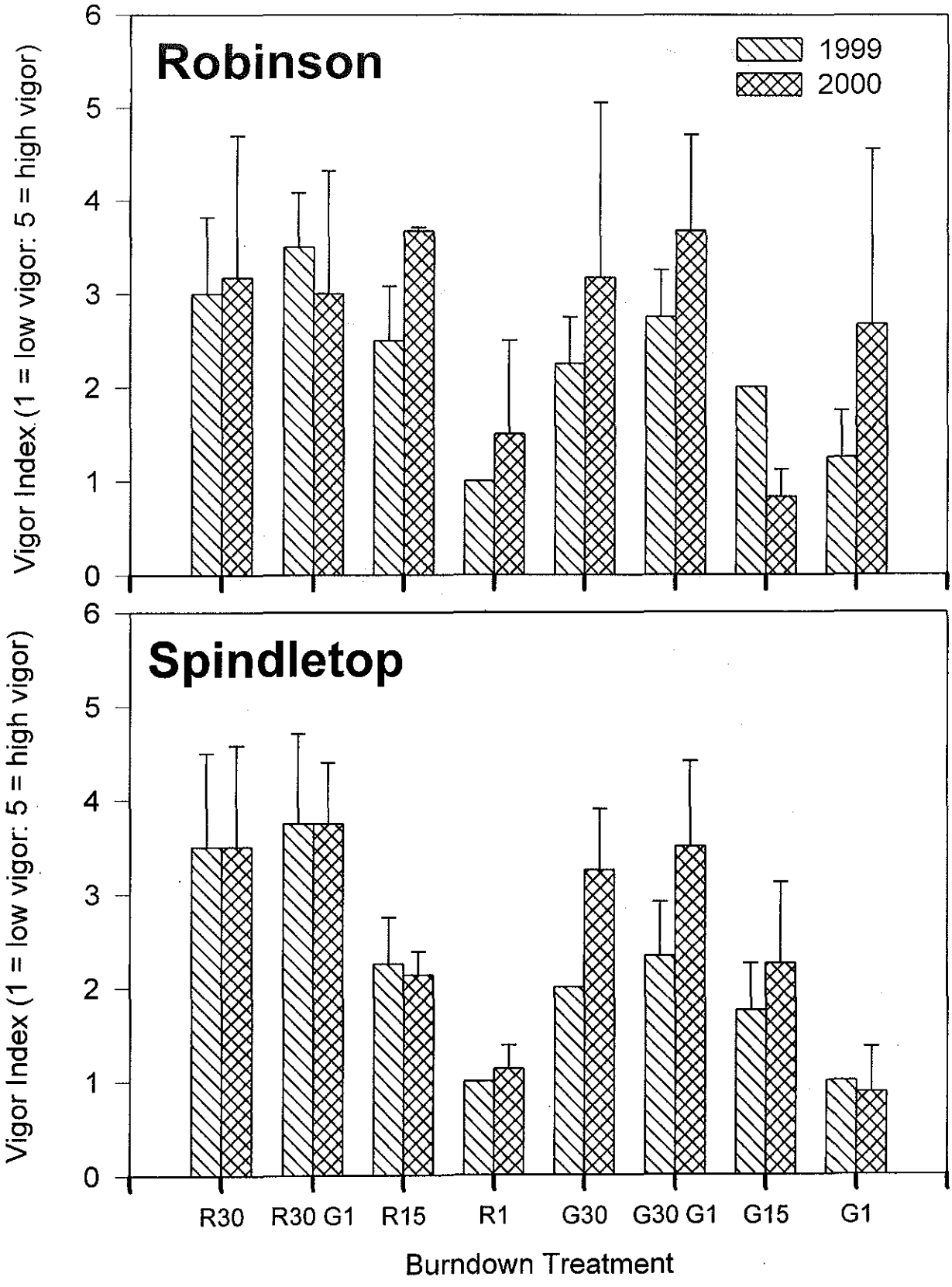

Figure 2. Early season plant vigor rating as influenced by the time of burndown and chemical used. Error bars represent the standard deviation of the mean. (R = Roundup; G = Gramoxone; numbers = days before planting.)

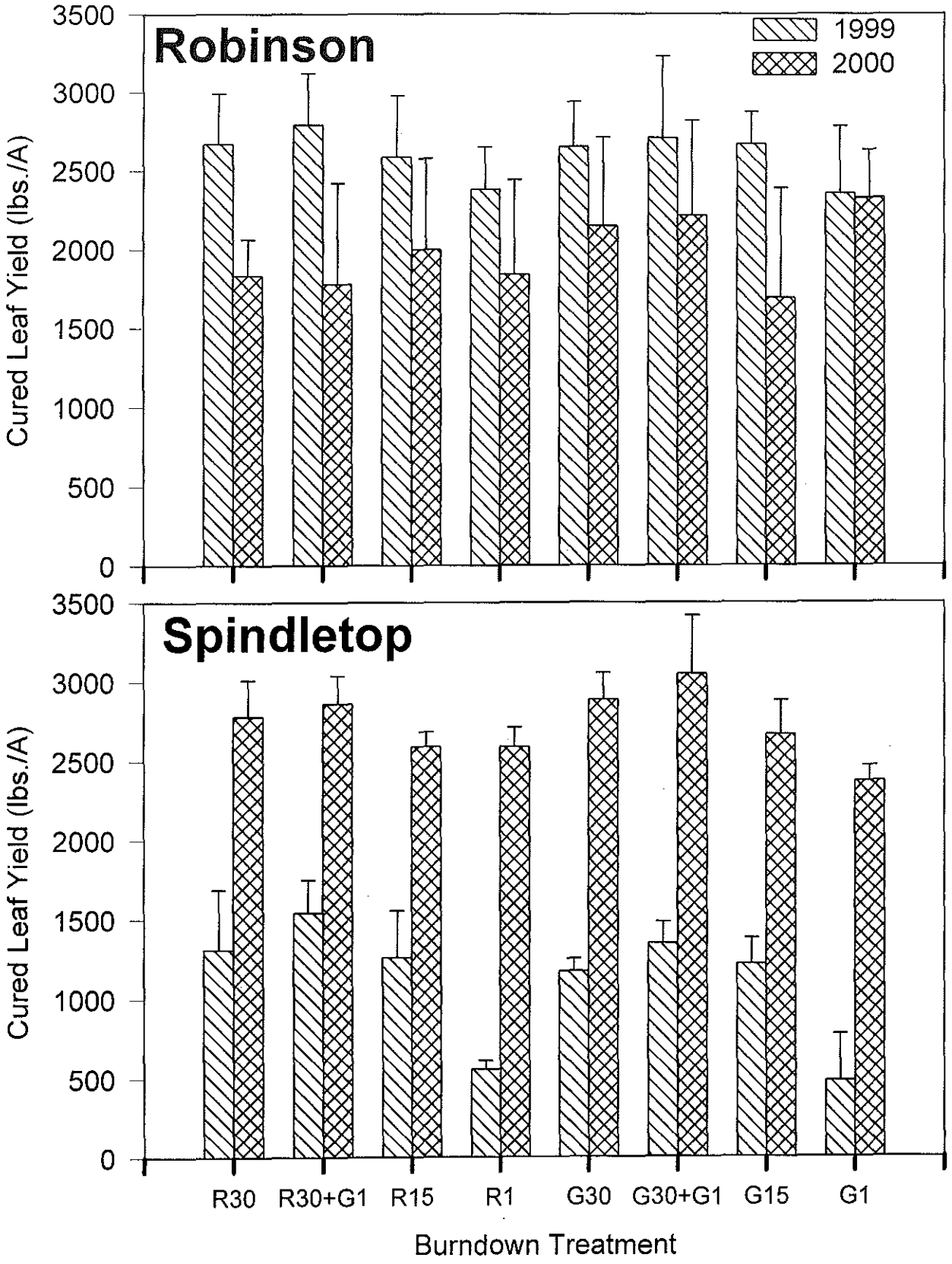

Figure 3. Cured leaf yield of no-till burley tobacco as influenced by the time of burndown and chemical used. Error bars represent the standard deveiation of the mean. (R = Roundup; G = Gramoxone; numbers = days before transplanting.)