

ECONOMICS OF WEED MANAGEMENT SYSTEMS IN BXN, ROUNDUP READY, AND CONVENTIONAL COTTON

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Abstract

Transgenic, herbicide-tolerant cotton cultivars give growers new options to manage weeds. Of particular interest to growers is the option to apply a herbicide overtop of small cotton as opposed to directed application.

An experiment was conducted in conventionally tilled cotton at Rocky Mount and Goldsboro, NC in 1996 and 1997 to compare weed control, cotton yield, and net returns from various management systems in Buctril-tolerant Stoneville BXN 47, Roundup-tolerant Paymaster 1220 RR, and non-transgenic DPL 51. Rocky Mount had a light to moderate infestation of broadleaf weeds and a severe infestation of large crabgrass. Goldsboro had a moderate infestation of broadleaf signalgrass and a heavy infestation of broadleaf weeds. Broadleaf weed species included pitted morningglory, sicklepod, smooth pigweed, common lambsquarters, prickly sida, and jimsonweed. Prowl preplant incorporated (PPI) was broadcast whereas Cotoran preemergence (PRE) and all postemergence herbicides were applied in an 18-inch band in 36-inch rows. Early postemergence-directed (EPOST-DIR) and early postemergence over-the-top (EPOST) treatments were applied to three- to four-leaf cotton. Late postemergence-directed (LPOST-DIR) treatments were applied to cotton 8 to 10 inches tall. All plots except the non-treated checks in each variety were cultivated twice. Cultivated checks were included for each variety. Late-season weed control ratings are reported.

Herbicide application rates per acre were as follows: Prowl PPI, 1.8 qt; Cotoran PRE, 1.5 qt; Cotoran plus MSMA EPOST-DIR, 1 + 1.2 qt; Staple EPOST, 1.2 oz; Buctril EPOST, 1 pt; Buctril plus MSMA EPOST, 1 + 1 pt; Roundup EPOST or LPOST-DIR, 1.5 pt; and Bladex plus MSMA LPOST-DIR, 1 + 1.2 qt.

Weeds were controlled poorly by cultivation alone. Non-treated and cultivated checks could not be harvested due to severe weed infestations.

In non-transgenic cotton, Prowl PPI plus Cotoran PRE controlled sicklepod, pitted morningglory, and prickly sida 69, 76, and 78%, respectively, late in the season. Other species were controlled at least 90%. Bladex plus MSMA LPOST-DIR increased sicklepod, pitted morningglory, and

prickly sida control to 85, 94, and 92%, respectively, and increased control of other species to at least 96%. Prowl PPI, Cotoran PRE, Cotoran plus MSMA EPOST-DIR, and Bladex plus MSMA LPOST-DIR (hereafter referred to as the standard system) controlled all species at least 98%. Compared with systems containing only Prowl PPI and Cotoran PRE, adding Bladex plus MSMA LPOST-DIR increased yield and net returns 36 and 82%, respectively, at Goldsboro. Adding Cotoran plus MSMA EPOST-DIR and Bladex plus MSMA LPOST-DIR increased yield and net returns 54 and 122%, respectively. Weed control, lint yield, and net returns were similar when Staple EPOST was substituted for Cotoran plus MSMA EPOST-DIR. At Rocky Mount, where the predominant weed was large crabgrass, yields and net returns were similar with all systems in the non-transgenic cotton due to good control by Prowl PPI and Cotoran PRE.

Systems in BXN cotton included Prowl PPI or Prowl PPI plus Cotoran PRE followed by Buctril EPOST or Buctril plus MSMA EPOST and Bladex plus MSMA LPOST-DIR. The standard treatment also was included. Compared with a system of Prowl PPI, Buctril EPOST, and Bladex plus MSMA LPOST-DIR, adding Cotoran PRE and mixing MSMA with Buctril increased control of large crabgrass and broadleaf signalgrass. Cotoran PRE did not increase control of broadleaf weeds, but MSMA increased control of sicklepod. The best BXN system overall was Prowl PPI, Cotoran PRE, Buctril plus MSMA EPOST, and Bladex plus MSMA LPOST-DIR. This system controlled broadleaf signalgrass, large crabgrass, pitted morningglory, sicklepod, smooth pigweed, common lambsquarters, prickly sida, and jimsonweed 97 to 100% late in the season. Yield and net returns with this BXN system were statistically equivalent to those with the standard herbicide system.

Treatments in Roundup Ready cotton included Roundup applied EPOST followed by either Roundup or Bladex plus MSMA LPOST-DIR. Each of these postemergence systems was present with and without Prowl and Cotoran. The standard also was included. All systems in Roundup Ready cotton were similarly effective on broadleaf signalgrass, sicklepod, prickly sida, and jimsonweed and controlled these weeds 96 to 100%. Roundup applied twice or Roundup EPOST followed by Bladex plus MSMA LPOST-DIR controlled common lambsquarters and smooth pigweed 95 to 96%. Adding Prowl plus Cotoran increased control to 99 to 100%. Roundup EPOST followed by Roundup LPOST-DIR controlled pitted morningglory 89% compared with 97 to 98% control by Roundup EPOST followed by Bladex plus MSMA LPOST-DIR or Prowl PPI plus Cotoran PRE followed by Roundup applied twice. Large crabgrass was controlled 90% by Roundup applied twice as compared with 97% by Roundup EPOST followed by Bladex plus MSMA LPOST-DIR and 99% by Prowl plus Cotoran followed by Roundup applied twice. All weeds were controlled equally well by Roundup EPOST followed

by Bladex plus MSMA LPOST-DIR and the standard treatment.

At Goldsboro, yields and net returns with all Roundup systems were statistically equivalent to yield and net returns with the standard program. However, yield and net returns were 23 to 26% and 35 to 46% greater, respectively, with Prowl PPI, Cotoran PRE, Roundup EPOST, and Bladex plus MSMA LPOST-DIR than with other Roundup systems.

At Rocky Mount, yields and net returns from systems with Prowl PPI, Cotoran PRE, Roundup EPOST, and either Roundup or Bladex plus MSMA LPOST-DIR were similar to those with the standard system. However, yields and net returns from systems with Roundup EPOST and either Roundup or Bladex plus MSMA LPOST-DIR in the absence of soil-applied herbicides were 23 to 30% and 40 to 51% less, respectively, than with the standard system. This was attributed to early season competition from the extremely heavy large crabgrass infestation prior to initiation of Roundup application at three- to four-leaf cotton.

An additional treatment consisting of Roundup EPOST at one-leaf cotton followed by Roundup LPOST-DIR to 8- to 9-inch cotton was included in Roundup Ready cotton in 1997. With this treatment, control was apparently initiated before the crabgrass competed enough with the cotton to adversely affect growth and yield. Yield and net returns with Roundup EPOST at one-leaf cotton followed by Roundup LPOST-DIR were 32 and 61% greater, respectively, than when Roundup application was delayed until the three- to four-leaf stage. Yield and net returns with Roundup EPOST to one-leaf cotton followed by Roundup LPOST-DIR were similar to those with Prowl PPI, Cotoran PRE, Roundup EPOST at three- to four-leaf cotton, and Roundup LPOST-DIR.

Cotton lint yields with the three varieties were statistically equivalent when treated with the standard herbicide program. Averaged over years and locations, lint yield was 1180 lb/acre.

When variety/herbicide systems were compared, yields and net returns were statistically equivalent with the following systems:

Variety	Herbicide System			
	PPI	PRE*	EPOST or EPOST-DIR*	LPOST-DIR
DPL 51	Prowl	Cot	Cot+MSMA	Bld+MSMA
DPL 51	Prowl	Cot	Staple	Bld+MSMA
BXN 47	Prowl	None	Buc+MSMA	Bld+MSMA
BXN 47	Prowl	Cot	Buc+MSMA	Bld+MSMA
PM 1220RR	Prowl	Cot	Roundup	Bld+MSMA
PM 1220RR	Prowl	Cot	Roundup	Roundup

*Cot = Cotoran; Buc = Buctril; Bld = Bladex.