RESPONSE OF COTTON VARIETIES TO IN-FURROW APPLICATIONS OF VELUM® TOTAL

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Abstract

A field trial was conducted during the 2015 growing season to evaluate the response of ten commercially available cotton varieties to in-furrow applications of Velum® Total for management of the root-knot nematode (*Meloidogyne incognita*). Under low to moderate nematode pressure, differences in lint yield, loan value, gross and net returns were observed between varieties. Lint yields ranged from 1,1321 to 1,693 lb acre^{-1} for FiberMax 2484 B2F and Deltapine 1558 NR B2RF, respectively. Varieties differed somewhat in response to applications of Velum® Total; however, yields between the two rates (0 and 18 fl oz acre^{-1}) were generally similar. Differences in most all fiber quality parameters were observed between varieties. Loan values were greatest for Deltapine 1558 NR B2RF ($0.517 lb^{-1}) followed by Deltapine 1454 NR B2RF, FiberMax 2011 GT, and FiberMax 2484 B2F at 0.509, 0.506 and 0.505 ($ lb^{-1}), respectively. When combining lint yield and loan value, gross returns were greatest for the partially resistant variety Deltapine 1558 NR B2RF ($776 acre^{-1}) and lowest for the susceptible varieties FiberMax 2484 B2F ($571 acre^{-1}) and Deltapine 1044 B2RF ($567 acre^{-1}). When averaged across varieties, gross returns (which included application costs, estimated at $27 acre^{-1}) were numerically higher when Velum® Total was applied, but net returns for the two treatments were identical at $601 acre^{-1}. The registration of Velum® Total provides producers with a new chemical management option for nematodes. While variability in the data presented in this trial did not allow for a separation between the application of Velum® Total and the non-treated control, the lack of a significant economic loss when Velum® Total was used is encouraging. Additional studies in fields with increased nematode pressure are needed to best identify situations when Velum® Total, partially resistant varieties, or combinations of these two should be utilized.

Introduction

Root-knot nematodes (*Meloidogyne incognita*) are an economically important pest of cotton in west Texas. Surveys have indicated that over 40% of fields on the Southern High plains are infested with the pest (Starr et al., 1993; Wheeler et al., 2000) and yield reductions as high as 25% have been reported (Orr and Robinson, 1984). Consistent management of *M. incognita* in cotton requires the integration of multiple tactics including crop rotation, chemical nematicides and the use of partially resistant varieties (Koenning et al., 2004; Starr et al., 2007). Nematode resistant germplasm has been available for more than 40 years (Shephard, 1974); however, inherently low yield potential and poor fiber quality limited adoption by producers (Koenning et al., 2004; Starr et al., 2007). Currently, several varieties possessing partial resistance to *M. incognita* are commercially available (Ryan et al., 2015; Wheeler et al., 2014).

Chemical management options are limited pre-plant soil fumigants such as Telone II (Dow AgroSciences), seed treatment nematicides, such as Aeris or Avicta (Bayer CropScience and Syngenta Crop Protection, respectively), and post-emergence applications of Vydate (Dupont). Sporadic results, high cost, or the need for specialized application equipment has limited the use of the aforementioned products. The nematicide Velum® Total was recently registered for use in cotton and has been shown to be active on *M. incognita* (Faske and Hurd, 2014). Information on the efficacy of Velum® Total on partially resistant varieties from the Southern High Plains of Texas is limited, thus the objective of this study was to evaluate the response of commercially available cotton varieties to in-furrow applications of Velum® Total.

Materials and Methods

A field trial was conducted in Lubbock County, in a field infested with low to moderate levels of *M. incognita*. Treatments consisting of ten varieties with varying levels on root-knot nematode resistance and two Velum® Total rates (0 and 18 fl oz per acre) were arranged in a split-plot design with four replications. Velum® Total rate served as the whole plot and variety served as sub-plots. Plots were two rows wide (on 40 inch centers) and 35 feet in length. Lint yield, fiber quality, loan value, and gross and net returns were analyzed using Proc Glimmix, LSD (P<0.10).

Results and Discussion

Temperatures were well below and rainfall well above long-term averages early in the growing season; however, dry conditions were experienced July through September. As a result much of the west Texas cotton crop experienced little heat stress prior to bloom. Nematode damage was low in this and other studies conducted in 2015 (data not shown). Yields were highest for the two partially resistant varieties DP 1558 NR B2RF and ST 4946 GLB2, as well as the susceptible varieties NG 1511 B2RF and PHY 499 WRF (Fig. 1). Loan values ranged from $0.483 to $0.517 per lb for DP 1044 B2RF and DP 1558 NR B2RF, respectively (Table 2). Overall, Velum Total® had no effect on any of the variables evaluated (Tables 1 and 2). Net profits for the Velum® Total were identical to the non-treated control when averaged across all varieties (Table 2). Preliminary studies have shown that one of the active ingredients in Velum® Total (fluopyram) is active towards *M. incognita*. In this study, variety selection affected lint yield more so than the application of Velum® Total. Early season weather may have lessened the impact of nematodes, as plants were able to establish robust root systems before nematode populations reached thresholds. Additional studies evaluating these and other partially resistant varieties with and without Velum® Total are warranted.

Table 1. Level of significance for main and interactive effects of cotton varieties and the in-furrow nematicide Velum® Total for turnout, lint yield, loan value, gross return and net return

Source	Turnout (%)	Lint yield (lb acre^{-1})	Loan value ($ lb^{-1})	Gross return ($ acre^{-1})	Net return ($ acre^{-1})
Replication	0.9334	0.0001	0.9087	0.0001	0.0001
Variety (Var)	0.0002	0.0001	0.0397	0.0001	0.0001
Velum (Vel)	0.9008	0.3324	0.9608	0.3181	0.9944
Var*Vel	0.2529	0.9884	0.3219	0.9578	0.9580

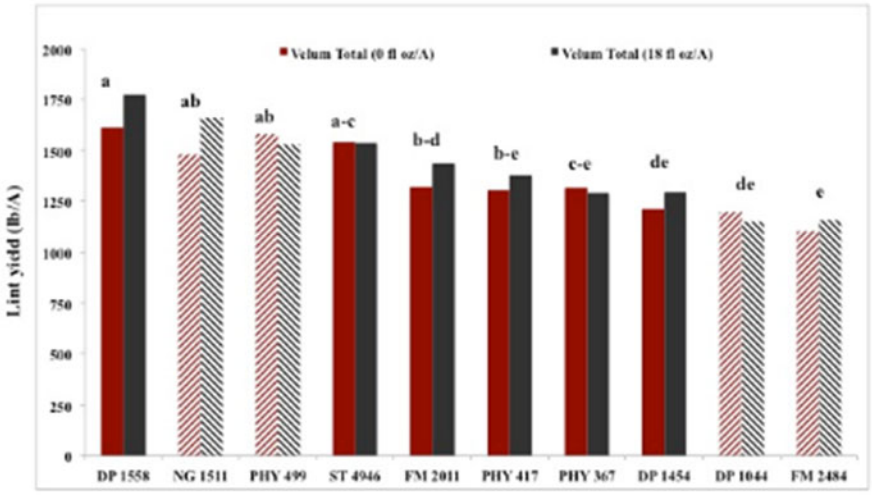

Figure 1. Lint yield of ten cotton varieties in response to Velum® Total in Lubbock Co. Data were combined for analysis and differences between varieties are denoted by different letters. Solid bars represent partially resistant varieties and hatched bars represent susceptible varieties.

Table 2. Gin turnout, loan value, gross and net returns for ten cotton varieties and the nematicide Velum® Total[z]

Factor, level Variety	Turnout (%)	Loan value[y] ($ lb^{-1})	Gross return[x] ($ acre^{-1})	Net return[w] ($ acre^{-1})
DP 1044	28.2 de	0.483 d	567 d	480 d
DP 1454	30.5 ab	0.509 ab	636 cd	537 cd
DP 1558	30.3 ab	0.517 a	875 a	776 a
FM 2011	29.6 bc	0.506 a-c	697 bc	615 bc
FM 2484	28.6 c-e	0.505 a-c	571 d	477 d
NG 1511	31.0 a	0.486 cd	763 ab	670 ab
PHY 367	29.4 b-e	0.490 b-d	637 cd	546 cd
PHY 417	28.1 e	0.495 b-d	667 b-d	571 b-d
PHY 499	29.6 b-d	0.495 b-d	771 ab	676 ab
ST 4946	28.7 c-e	0.499 a-d	763 ab	667 ab
LSD	1.3	0.021	119	118
Velum® Total				
(0 fl oz/A)	29.3 A	0.499 A	681 A	601 A
(18 fl oz/A)	29.4 A	0.498 A	708 A	601 A
LSD	n.s.	n.s.	n.s.	n.s.

[z]Values within a column followed by the same letter are not statistically different according to Fishers Protected LSD. [y]Loan values reflect fiber quality premiums and deductions, per the CCC marketing loan schedule. [x]Gross returns were calculated by multiplying lint yield by the appropriate loan value. [w]Net return reflects the Gross return minus seed and technology fees per acre, as well as the cost of Velum® Total, which was estimated at $27 per acre.

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