EFFECT OF FURADAN / DISULFOTON ON COTTON GROWTH AND DEVELOPMENT

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Abstract

In-furrow applications of Furadan / Di-Syston were compared to Temik in in-house and university trials from 1993-1996 for efficacy against early season pests, and effects on cotton growth and development, yield and fiber quality. All measurements including efficacy evaluations on thrips and aphids, seedling growth response, plant structure and fruiting patterns, yield, and fiber quality were equivalent for these insecticide treatments. Comparisons of in-furrow applications of Furadan / Di-Syston and Gaucho seed treatment were conducted in university trials in 1995 and 1996. Furadan / Di-Syston resulted in greater efficacy against early season insects and also in greater yields than Gaucho seed treatment. Results of these studies demonstrate that Furadan / Di-Syston in-furrow applications are an effective at-planting insecticide treatnent providing equal or greater efficacy, promoting equivalent earliness, and resulting in equal or greater yield and quality in comparison to current alternatives. This combination also provides the added benefits of more accurate and uniform insecticide placement associated with liquid insecticide applications, as well as providing safening from herbicide injury for growers who utilize Command herbicide programs.

Introduction

Furadan™ 4F (carbofuran) and Di-Syston™ (disulfoton) are labeled for use in cotton as in-furrow insecticides for controlling early season pests of cotton. Furadan is a carbamate, and like some other systemic carbamate insecticides (e.g. aldicarb), results in a physiological affect, manifested by more rapid plant development. In addition to it's insecticidal properties, Di-Syston is also utilized to safen cotton from injury from Command™ (clomazone) herbicide. Other commonly used insecticides such as Temik™ 15G (aldicarb) and Gaucho™ (imidacloprid - seed treatment) do not safen cotton from Command injury. When applied together as in-furrow cotton insecticide treatments, Furadan / Di-Syston provide for 1) two classes of chemistry acting in unison to control early-season insect pests; 2) enhancement of cotton growth and development; and 3) safening of cotton for growers who utilize Command herbicide programs for superior weed control. The objective of the research reported herein was to compare in-furrow applications of Furadan / Di-Syston versus Temik and versus Gaucho seed treatment for efficacy against early season insect pests, and for effects on cotton seedling development, vegetative growth and fruiting patterns, yield, and fiber quality.

Methods and Materials

In-house and university field studies were conducted in AL, AR, CA, LA, MO, MS, NC, TN, and TX in at least one of the growing seasons from 1993 to 1996, totaling 19 trials, to investigate the effect of in-furrow insecticides on efficacy against early season cotton pests, cotton growth and development, fiber quality, and yield. Treatments evaluated from 1993 to 1996 included in-furrow applications of Furadan 4F (0.5 lb ai/a) + Di-Syston 8EC (0.75 lb ai/a) versus Temik 15G (0.5 lb ai/a). In 1995 and 1996, the same Furadan / Di-Syston treatment was also compared to Gaucho seed treatment. The study design was RCB with 4 to 6 replications per trial. Plots were at least 4 rows by 50 feet. The cultivar utilized in all but two trials was 'Deltapine 50' , with the other being 'Deltapine 5415'. The herbicide program for the Furadan / Di-Syston treatment was Command + Cotoran (PRE, 1.0 + 1.2 lb ai/a, respectively) and herbicides utilized in the Temik and Gaucho treatments were standards for each respective location. Trials were established at locations and on soils commonly planted to cotton, and standard soil fertility and insect control practices were implemented.

For both comparisons, data on thrips efficacy were obtained from 2 to 37 days after emergence by methods including randomly collecting plants from each plot field for laboratory plant wash counts, or by vigorous shaking of cotton seedlings into collecting pans for in-field counting, with results presented as total immatures and adults per plant at each sampling date. Aphid efficacy data were obtained at 10 to 45 days after emergence through plant wash samples or in-field counts, and results are also expressed as adults and immatures per plant at each sampling date. For the Furadan / Di-Syston versus Temik comparison, data on seedling development including plant height and node counts were collected at 28 to 56 days after emergence from 10 random plants per plot per sampling date. Measurements of earliness including node of 1st square and nodes above white flower were collected from 42 to 77 days after emergence from 10 random plants per plot per date. Observations on percent open bolls were collected from 109 to 124 days after emergence by evaluating 100 consecutive bolls per plot at each sampling date. For the Furadan / Di-Syston versus Temik comparisons, observations on plant structure and fruiting patterns including counts of monopodial and sympodial branches, node of 1st sympodia, plant height, internode length, number of bolls per plant, boll location and retention (by branch position), were obtained by conducting plant

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maps on 10 plants per plot at crop maturity (140 to 150 days after emergence). Yield data for both comparisons were obtained from each plot either mechanically or by 10 feet of row sections by hand. For the Furadan / Di-Syston vs. Temik comparison, data on fiber quality were obtained by harvesting 50 consecutive bolls from each plot which were subsequently ginned in the laboratory, and were submitted for HVI quality analysis.

Results and Discussion

Early Season Insect Control

Results of observations comparing Furadan / Di-Syston versus Temik at 2 through 37 days after emergence indicated that the level of thrips control for both treatments was equivalent (Figure 1). Observations at 10 to 30 days after emergence also indicated that the efficacy of these treatments against early-season aphids was comparable (Figure 2). Plant stand densities for these treatments were identical (Figure 3). In contrast, up to 30 days after emergence Furadan / Di-Syston consistently reduced thrips populations by greater than 50 percent in comparison to Gaucho. (Figure 4). However, aphid control obtained by these treatments appeared to be comparable (Figure 5). Seedling stand densities were slightly higher with the Gaucho treatment (Figure 6).

Plant Growth and Development

Rates of cotton growth and development with the Furadan / Di-Syston and Temik treatments were monitored at several locations each season. Results of observations on seedling plant height (Figure 7) and node development (Figure 8) taken at 28 through 56 days after emergence indicated that seedling growth responses were equivalent for both treatments. Node of 1st square and nodes above white flower are measurements of earliness which define the rate at which the transition from vegetative growth to fruit loading occurs. Observations on these respective measurements demonstrated that earliness obtained from these treatments was also equivalent (Figures 9 and 10). As cotton approached maturity, counts of percent open bolls also substantiated that treatments promoted earliness in the same manner (Figure 11).

Plant Structure / Fruiting Pattern

Results of plant maps conducted at harvest on Furadan / Di-Syston and Temik treatments demonstrated that vegetative growth patterns as measured by number of monopodia and sympodia (Figure 12), node of 1st sympodia (Figure 13), plant height (Figure 14), and internode length (Figure 15) were equivalent. Similarly, fruiting patterns as measured by total bolls per plant and percent of total bolls on 1st, 2nd, and outer positions, and on monopodia were also equivalent (Figures 16, 17). Measurements of percent boll retention on the 1st and 2nd positions of all sympodia and on both 1st and 2nd positions of the lowest five sympodia were also equivalent (Figure 18).

Yield and Fiber Quality

Seedcotton yield resulting from Furadan / Di-Syston treatments was equivalent to that obtained from Temik. (Figure 19). Seedcotton yield resulting from trials comparing Furadan / Di-Syston vs. Gaucho suggested a slight yield advantage with Furadan / Di-Syston (Figure 20). Evaluations of cotton fiber properties resulting from comparisons of Furadan / Di-Syston vs. Temik demonstrated no differences in fiber length, length uniformity strength, or micronaire (Figures 21 to 24).

Conclusions

Results of studies comparing in-furrow applications of Furadan / Di-Syston vs. Temik demonstrated that crop development factors including early-season insect control, seedling growth response, earliness, plant structure and fruiting patterns, yield and fiber quality were equivalent. Results of other comparisons demonstrated that early-season insect control and yield were superior with Furadan / Di-Syston in comparison to Gaucho seed treatments. In addition to providing excellent insect control and optimizing earliness, yield, and fiber quality, in-furrow applications of Furadan / Di-Syston provide the advantage of the more accurate and uniform placement associated with the use of liquid applications, and also the advantage of safening cotton from injury by Command herbicide.

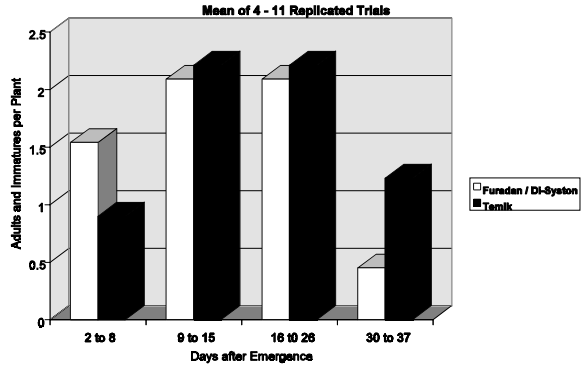


Figure 1. Efficacy - Thrips Control 1993 - 1996.

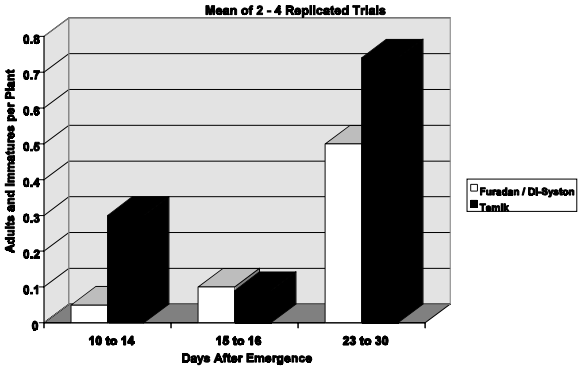


Figure 2. Efficacy - Aphid Control 1993 - 1996.

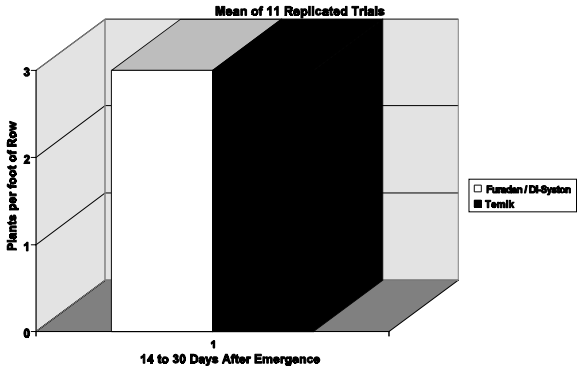


Figure 3. Efficacy - Stand Density 1993 - 1996.

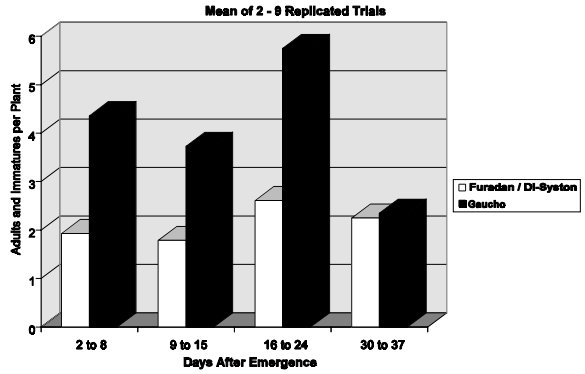


Figure 4. Efficacy - Thrips Control 1995 - 1996.

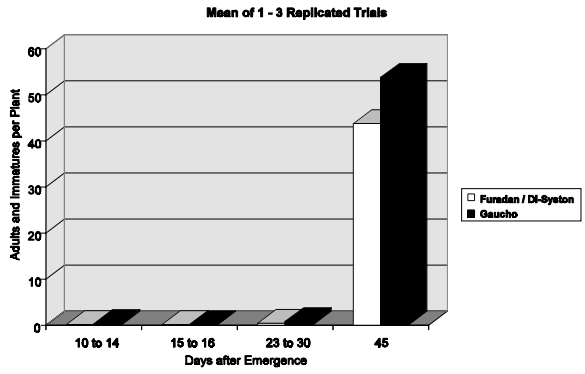


Figure 5. Efficacy - Aphid Control 1996.

Figure 6. Efficacy - Plant Stand Density 1995 - 1996.

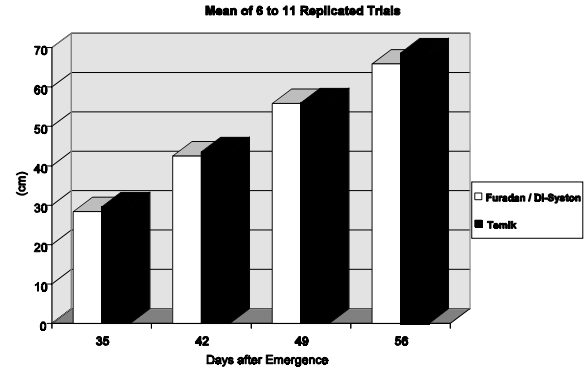


Figure 7. Growth and Development - Plant Height 1993 - 1996.

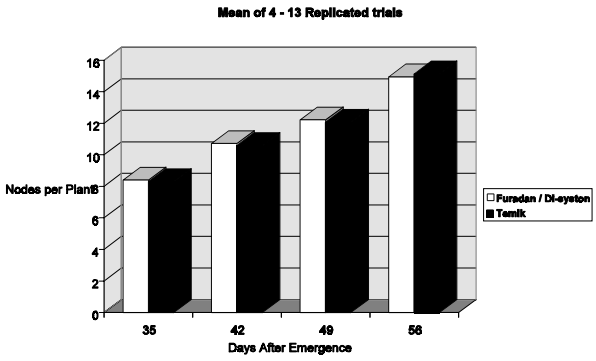


Figure 8. Growth and Development - Nodes 1993 - 1996.

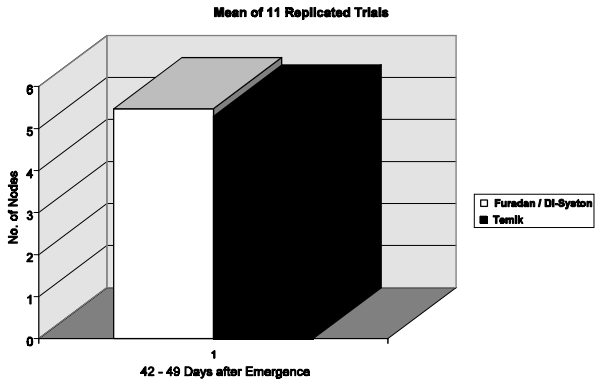


Figure 9. Growth and Development - Node of 1st Square 1993 - 1996.

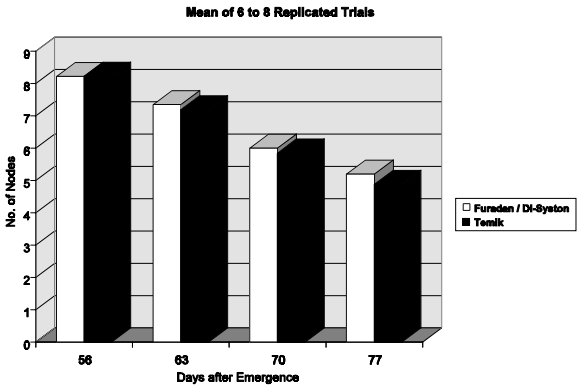


Figure 10. Growth and Development - Nodes Above White Flower 1993 - 1995.

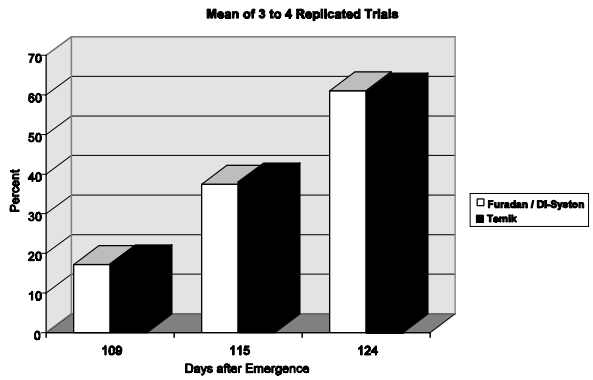


Figure 11. Growth and Development - Open Bolls 1993 - 1995.

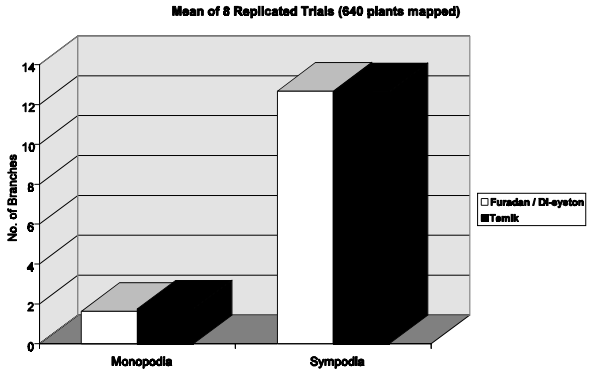


Figure 12. Plant Structure 1993 - 1996.

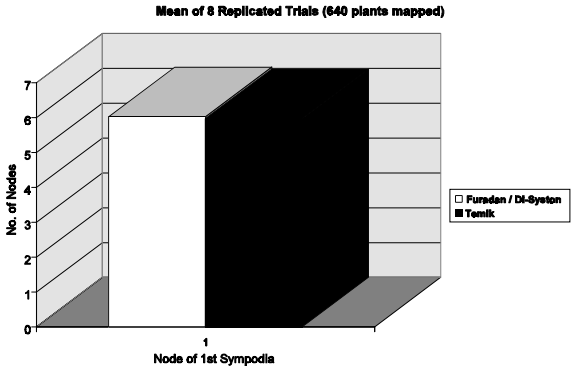


Figure 13. Plant Structure 1993 - 1996.

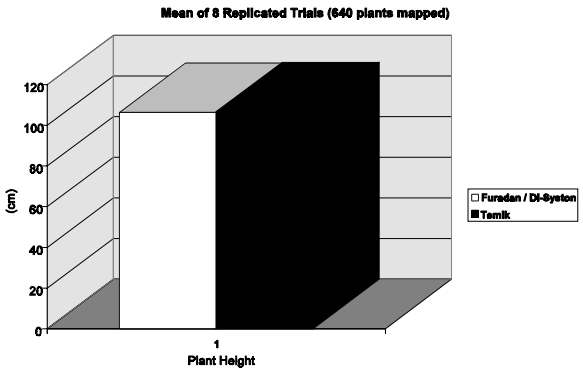


Figure 14. Plant Structure 1993 - 1996.

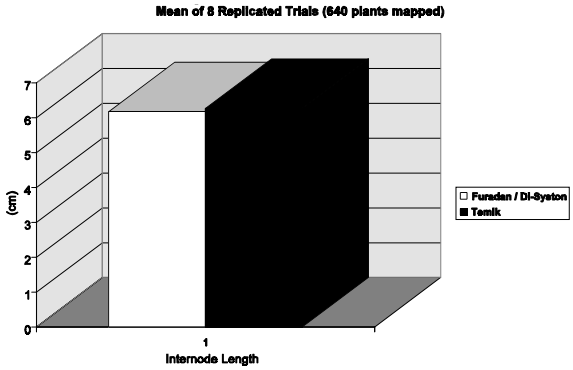


Figure 15. Plant Structure 1993 - 1996.

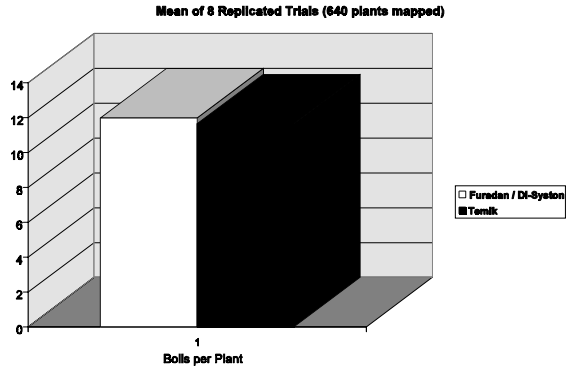


Figure 16. Fruiting Pattern 1993 - 1996.

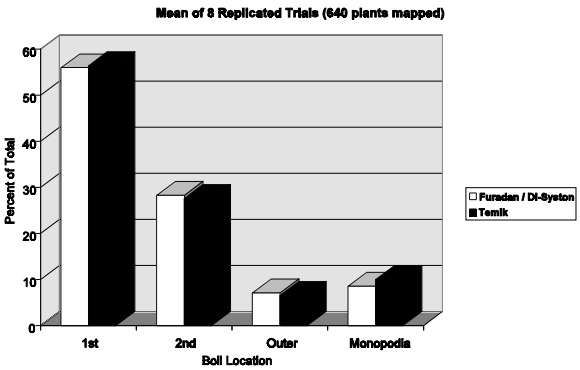


Figure 17. Fruiting Pattern 1993 - 1996.

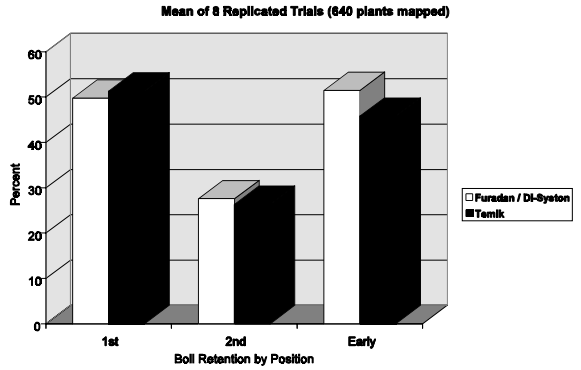


Figure 18. Fruiting Pattern 1993 - 1996.

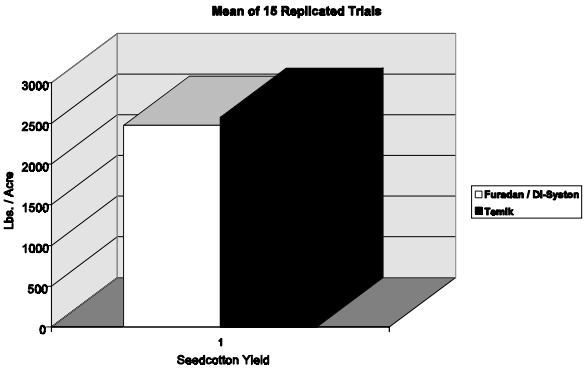


Figure 19. Cotton Yield 1993 - 1996.

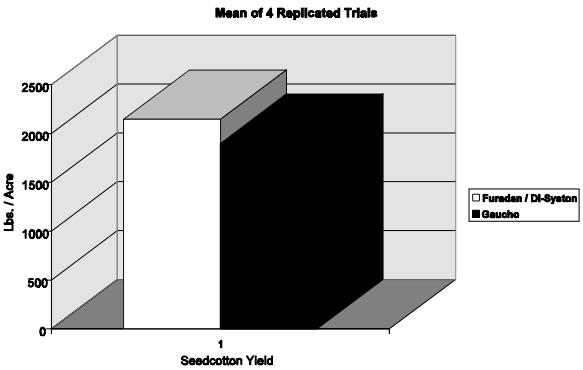


Figure 20. Cotton Yield 1995 - 1996.

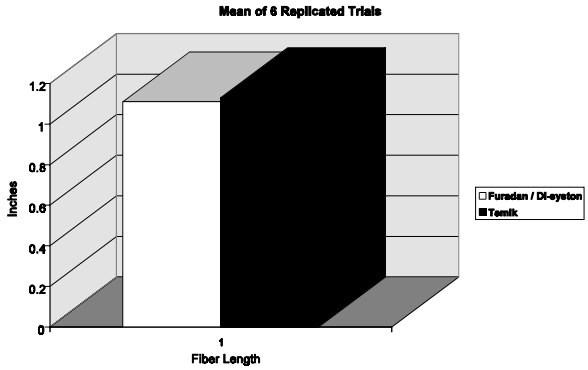
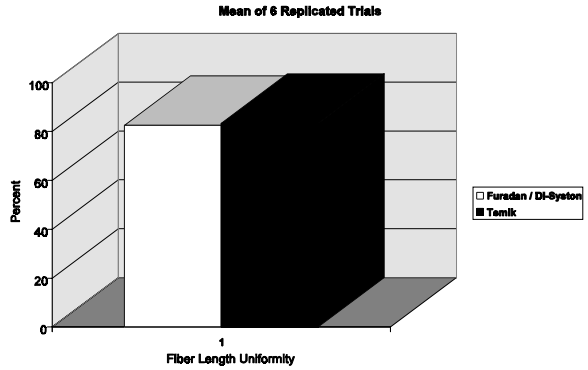


Figure 21. Fiber Quality 1993 - 1995.



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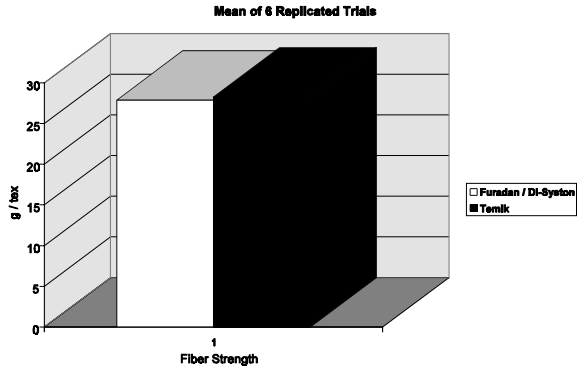

Figure 23. Fiber Quality 1993 - 1995.

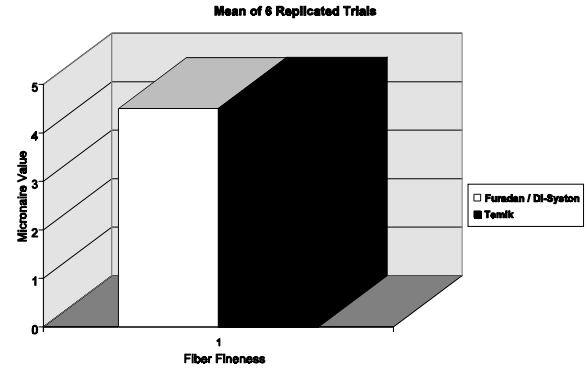

Figure 24. Fiber Quality 1993 - 1995.