TEMIK 15G® COMPARED TO SEED TREATMENTS ON PAYMASTER 1215 BG® COTTON VARIETY

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Abstract

Aldicarb- 15 G (Temik®) has been used for several years on cotton in the Mid-South for early-season insect control. In 1997, Rhone-Poulenc, in conjunction with the Agricenter International in Memphis, TN -initiated an extensive trial to investigate the impacts current at-planting systems have on the growth and development of cotton. The objective was to obtain data pertinent to the economic effects of at-planting insecticide treatments on BT cotton and to further explore their impacts on earliness and growth and development which extended beyond sole insect control. Results from the location in West TN- showed that the Temik® treatment provided less thrip injury, fewer plants with aborted terminals, greater initial plant height and first position boll retention, improved earliness, harvest-aid efficacy, fewer days to harvest and increased yield over the comparative treatments. Further data from box-mapping showed that the Temik® treatment increased pounds of lint cotton/acre from nodes 4-8 and 9-14 and increased yield at the first and second fruiting positions. This treatment also increased overall yield, on the average, by 389 pounds of lint cotton/acre.

Introduction

Background

Protection of pre-squaring and early-squaring cotton has been shown to be an important link to earliness (Parvin et al., 1987). Rosco et al., 1997 noted a delay in cotton maturity while evaluating foliar insecticides on pre-squaring cotton. This was further verified by Andrews et al., 1997, while evaluating the impacts of insect complexes on early fruiting sites. From mechanical square removal studies, these delays have been further qualified. Turnipseed et al., 1995 showed a week delay in maturity from mechanical fruit removal. One of the most detailed studies was performed by Phelps et al., 1997 through box-mapping processes that showed harvest delays of 2-14 days in maturity when square removal occurred at 2, 3 and 4 weeks following square initiation. In the extreme North Delta where the cotton - growing -season is shorter than many regions, Stevens et al. 1995 noted the importance of early-season inputs in securing early maturity. The importance of protecting early fruiting-sites and alleviating early stresses to pre-squaring cotton has been further related to varietal differences. Jenkins and McCarty, 1995 showed that early maturing cotton varieties like DES 119 produced 41 percent of its crop on the first five main-stem fruiting nodes while DP&L 5415 only produced 27% of its crop on the same main-stem nodes. Several researchers have shown varietal differences relative to early thrip damage (All et al., 1995, Studebaker et al., 1995 and Scott et al., 1997). All et al., 1995 and Studebaker et al., 1995 show positive responses from Aldicarb in these cases. Roberts and Rechel, (1996) have shown ,via growth chamber studies, that Temik® in the presence of thrips increased biomass of the root and stalk systems which converted to earliness and yield increases. Other researchers have also shown improved earliness and yields with Temik® compared to seed treatments and other at-planting treatments relative to thrip control (Burris et al., 1995, Cook et al. 1997, Herbert et al., 1997, Lentz et al., 1994, Lentz et al, 1997, Scott et al., 1997,).

Materials and Methods

On May 21, 1997, the test was initiated at the Agricenter International in Memphis, TN. Paymaster 1215 BG® cotton variety was planted at four seed/foot into 40 foot long plots. Each plot consisted of four 38 inch rows. At-planting insecticide treatments included commercial two-way treated seed with an at-planting treatment of Temik 15G® @ 4.0 Lb. product/Ac., commercial three-way seed treatment where Gaucho® was the insecticide treatment, commercial three-way treated seed where Orthene® was the insecticide treatment and an untreated check. All seed originated from the same seed lot to avoid variability due to seed lots.

The statistical design was established as a Randomized Complete Block with three replications. The data was analyzed using the Duncan's Multiple Range Test at the .05 level of probability.

In-the-Season Monitoring

Visual thrip injury/plot was evaluated over a two week period beginning on 6-15-97 and terminating on 6-25-97. Aborted Terminals/20 feet were evaluated on 7-25-97. A plant was considered having an aborted terminal if growth of the main axis showed visual disruption of the normal growth process. Plant mapping of six plants/plot was conducted from 7-27-97 to 9-19-97 using the Nodes Above White Bloom methodology. This method was used to determine plant height, percent boll retention at first position fruiting sites and percent open bolls at first position fruiting sites. Percent natural plant defoliation was assessed on 9-12-97 and 9-19-97. Harvest-aid efficacy was evaluated on 9-27-97, six days following an application of Finish® at 2.0 Lb. AI/Ac, for percent defoliation, percent open boll and days to harvest. Hand-harvest was conducted on 9-28-97 and 10-5-97 (seven and 14 days following the harvest-aid application) and Lb. of seed cotton was converted to Lb. of lint cotton/Ac. using the variety's respective lint percent. Box-Mapping was conducted to evaluate in detail the impacts of each treatment upon the growth and development of this variety. This process

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investigated nodal zones of each treatment within the variety. Zones were divided into nodes 4-8, 9-14 and > 14. This system also investigated the contribution of different fruiting positions along the fruiting branch, as well as, the contribution of vegetative branches. This system also afforded the capability to assign dollar values to zones, positions and fruit born on vegetative branches. This process was conducted on 9-28-97 by cutting and removing all plants from ten feet of row. Harvest ready lint was removed and mapped accordingly. Plants were then placed in a greenhouse for one week and the process conducted again to simulate a second harvest.

Discussion

% Thrip Injury, Plant Height

The Temik® treatment showed lower levels of Thrip injury at both rating dates (Figure 1). This treatment was significantly lower in injury than the check or three-way seed treatment. Thrips injury did not differ significantly in the Temik® and Gaucho® treatments but strong numerical differences did occur at both dates between these treatments. The Temik® treatment showed 40% and 17 % less injury on 6-15 and 6-26-97 respectively compared to Gaucho®. Further diagnosis showed that Temik® provided longer control of thrips than the comparative treatments. There was a trend for increased plant height with Temik at the first evaluation but by the 8-18-97 rating date there were no differences (Figure 2).

% Plants With Aborted Terminals

There were no significant differences between the insecticide treatments. However, the Temik® treatment indicated a strong numerical trend in reducing the percentage of plants with aborted terminals which indicated greater consistency across plants (Figure 3).

Nodes Above White Bloom

The Temik® treatment showed a significantly lower number of Nodes Above White Bloom on 8-18-97 (Figure 4).

% First Position Boll Retention

Initially (7-27 and 8-2-97) there were no statistical differences in boll retention between treatments (Figure 5). However, significant increases in boll retention did occur on 9-4-97 and 9-12-97 in the Temik® treatment as boll retention fell below 70% in the comparative treatments. Temik® stabilized boll retention earlier and maintained it at a higher level until 9-12-97 while the comparative treatments fell below 70 percent during this period (Figure 5 & 6)

% Natural Open Boll & Defoliation

Temik® showed a significantly higher level of natural boll opening on 9-97 (38% greater) than the comparative treatments (Figure 7) which further verifies the earliness of this treatment. On 9-11-97 the Temik® treatment was not significantly, but was numerically higher than the comparative treatments. Percent natural defoliation (Figure 8) in the Temik® treatment on 9-12-97 was 11% higher compared to seed treatments and on 9-19-97, the Temik® treatment was 17-20% greater in defoliation than the tree-way and Gaucho® seed treatments respectively. This can be linked to the increased level of first position bolls retained.

Harvest-Aid Impacts

Six days following the application of Finish® at 2.0 Lb. AI/Ac. the Temik® treatment showed significantly improved percent defoliation and numerically greater boll opening compared to Gaucho® and three-way seed treatments (Figure 9).

Box-Mapping-Yield by Zone

Pounds of lint cotton/acre by zone indicated a significantly higher yield during the first harvest from zone 1 (nodes 4-8) and zone 2 (nodes 9-14) in the Temik® treatment compared to the seed treatments. However, all treatments produced little cotton at zone 3 (nodes > 14) (Figure 10). Numerically, the Temik® treatment did improve yield. Second harvest yields from zone1 showed no differences and little cotton to be harvested on this date (Figure 11). However, yields increased numerically at zone 2 for the seed treatments but no treatment differences were detected. There was less second harvest yield from the Temik® treatment compared to the first harvest, indicating earliness and improved harvest efficiency.

Box-Mapping-Yield by Position

First harvest yields revealed that Temik® significantly increased yield above the seed treatments at fruiting positions 1 and 2 while little cotton was produced from any treatment at position > 2 (Figure 12). Yields from the second harvest showed little differences at these fruiting positions. However, Temik® did show the least increase in yield from the first harvest to the second harvest (Figure13). Again, this verifies earliness and harvest efficiency favoring the Temik® treatment.

Box-Mapping-Yield From Vegetative Branches

Temik® treatment significantly increased yield from vegetative branches over the seed treatments (Figure 14). There were no differences between treatments during the second harvest. However, yield in Temik® treatment increased less from the first to second harvest compared to the seed treatments. This again indicates earliness favoring Temik®.

Box-Mapping-Yield From Plants with Aborted Terminals

Yield from plants with aborted terminals at the first harvest showed no significant differences. However, the Temik® treatment did show the lowest yield numerically when compared to the seed treatments. Yields from the second harvest indicated significant yield increases from plants with aborted terminals in all seed treatments compared to Temik® (Figure 15). This indicates consistency across the

field in the Temik® over the seed treatments which further relates to earliness.

Box-Mapping Yield & % First Harvest

The Temik® treatment significantly increased yield over the seed treatments from the first harvest. This resulted in yield increases of 394, 432, and 762 Lb. of lint cotton/acre over Gaucho® seed treatment, three-way seed treatment and untreated check respectively (Figure 16). This further related to 24, 25 and 47 % greater first harvest respectively (Figure 17). Total yield from the first and second harvests revealed Temik ® increased yields by 204, 297 and 673 Lb. of lint/acre over Gaucho® seed treatment, three-way seed treatment and untreated check respectively (Figure 18).

Box-Mapping-Cumulative Data

This data further verifies earliness across time by nodes. It shows the Temik® treatment produced cotton one node earlier than the seed treatments and began a sharp increase upward to node 12 and 13 as it began to stabilize. The gentle sloping lines of the seed treatments and untreated check indicate their lateness. Temik® showed the greatest earliness followed by Gaucho® seed treatment, three-way seed treatment and the untreated check (Figure 19 & 20).

Summary

The Temik® treatment greatly reduced thrip injury, increased initial plant height, reduced plants with aborted terminals, reduced the number of Nodes Above White Bloom, increased first position boll retention, improved natural defoliation and boll opening and improved the efficacy of the harvest-aid. Box-mapping data showed improved yield from the Temik® treatment at nodes 4-8 and 9-14 and the first and second fruiting positions. This treatment also increased yield from the first harvest indicating a strong factor toward earliness.

Acknowledgments

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Temik® is a registered trademark of Rhone-Poulenc Ag Company.
Gaucho® is a registered trademark of Bayer Ag.
Orthene® is a registered trademark of Valent Corp.
Bollgard® is a registered trademark of Monsanto
Paymaster 1215 BG® is a registered trademark of Paymaster Seed.

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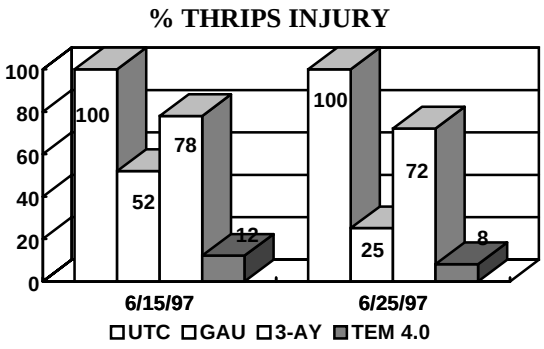

Figure 1. Visual assessment of thrips injury.

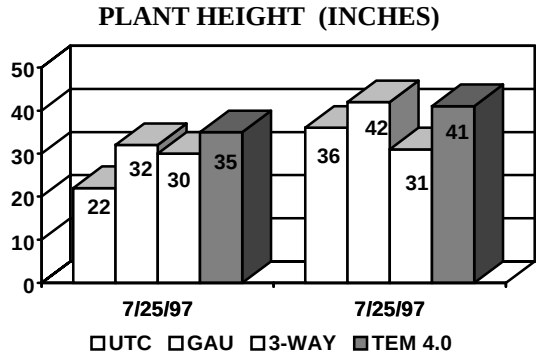

Figure 2. Plant height in inches.

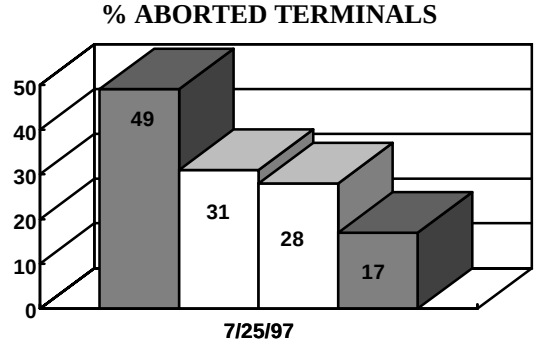

Figure 3. Percent of plants having malformed main-axis per 20 feet.

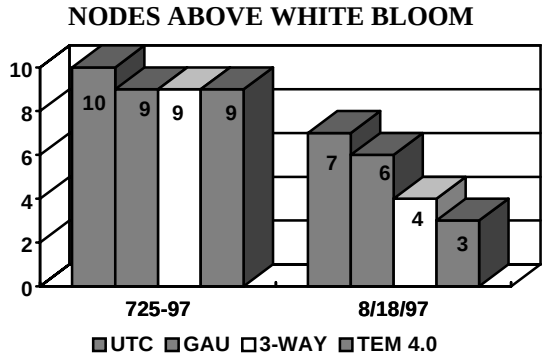

Figure 4. Nodes Above White Bloom.

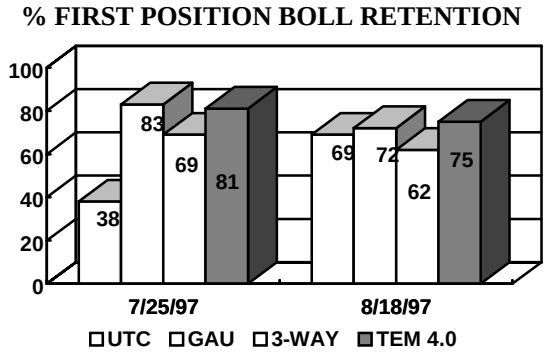

Figure 5. Percent first position boll retention.

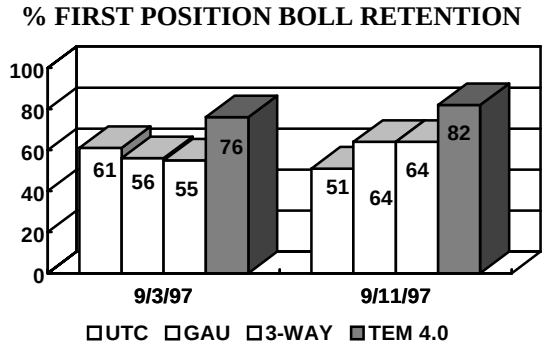

Figure 6. Percent first position boll retention.

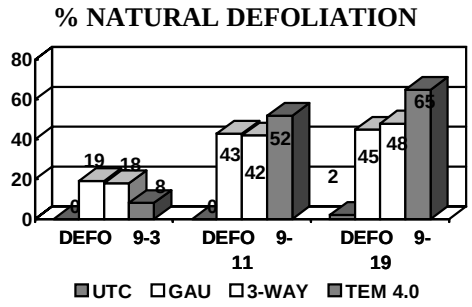

Figure 7. Percent natural defoliation.

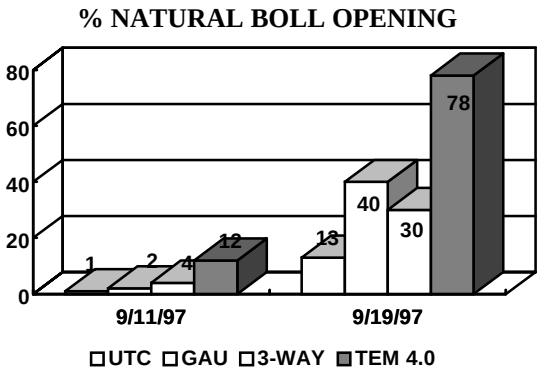

Figure 8. Percent natural boll opening.

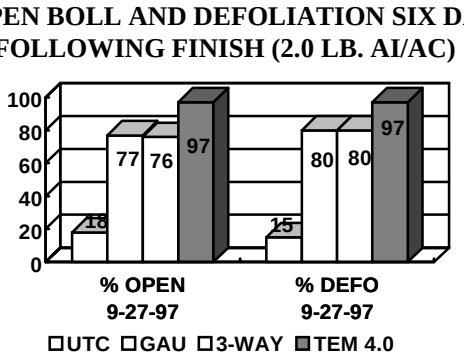

Figure 9. Percent open boll and defoliation six days following the application of Finish. Visual assessment. Harvest-aid applied on 9-21-97.

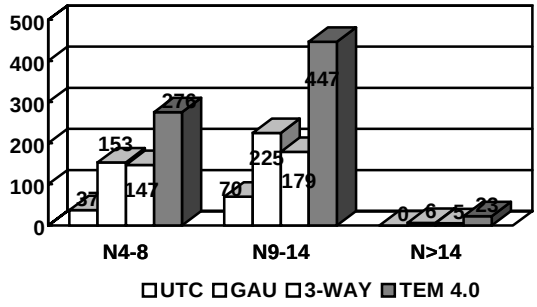

Figure 10. Pounds lint cotton per acre by fruiting zone for first harvest conducted seven days following harvest-aid application. Hand harvest-box-map data.

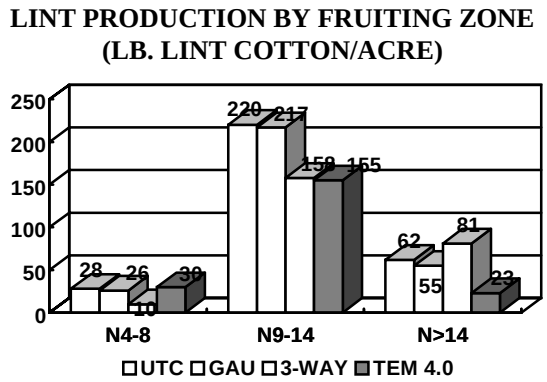

Figure 11. Pounds lint cotton per acre by fruiting zone for second harvest conducted 14 days following harvest-aid application. Hand -harvest-box-map data.

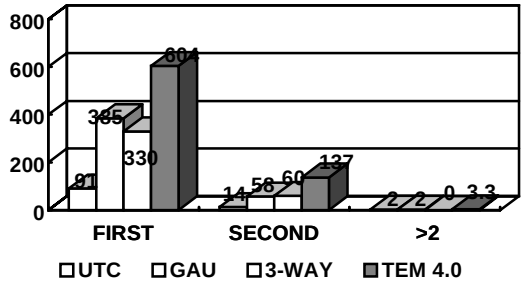

Figure 12. Pounds lint cotton per acre by fruiting position for first harvest conducted seven days following harvest-aid application. Hand -harvest-box-map data.

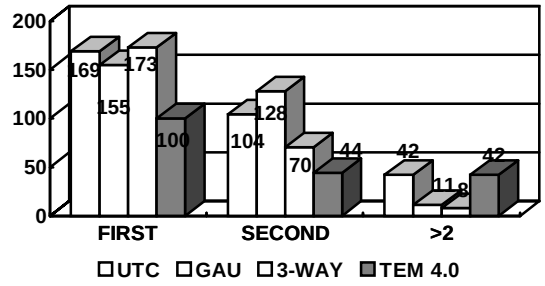

Figure 13. Pounds lint cotton per acre by fruiting position for second harvest conducted 14 days following harvest-aid application. Hand -harvest-box-map data.

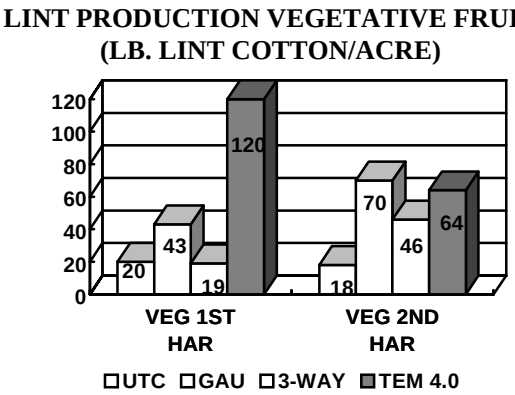

Figure 14. Pounds lint production per acre from fruit born on vegetative branches. First and second harvest from hand-harvest-box-map data (7 and 14 days following harvest-aid).

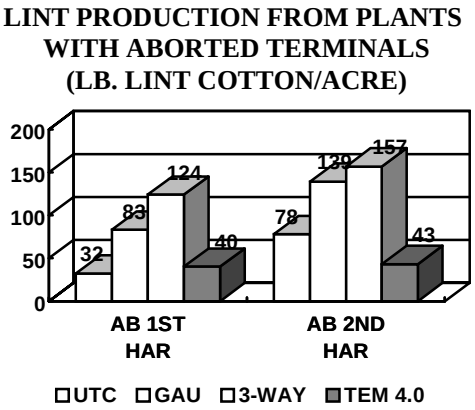

Figure 15. Pounds lint production per acre from fruit born on plants with aborted terminals. First and second harvest from hand-harvest-box-map data (7 and 14 days following harvest-aid).

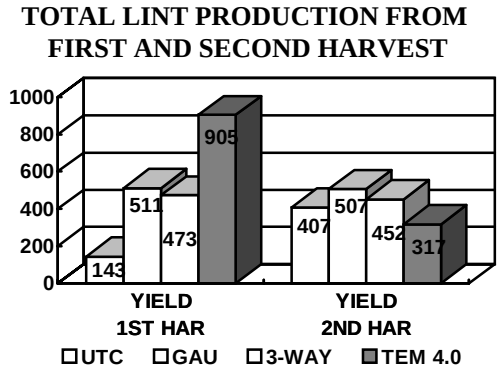

Figure 16. Total pounds of lint cotton per acre from first and second harvests. Hand-harvest-box-map data (7 and 14 days following harvest-aid).

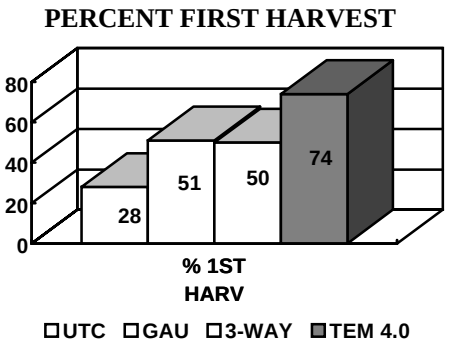

Figure 17. Percent first harvest contribution based on yield from first and second harvest. Hand-harvest-box-map data.

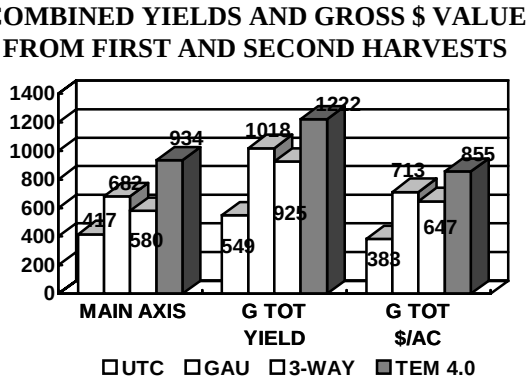

Figure 18. Pounds lint cotton per acre from main axis fruiting sites, total yield and gross dollar value at $0.70/pound from first and second harvests. Hand-harvest-box-map data (7 and 14 days following harvest-aid).

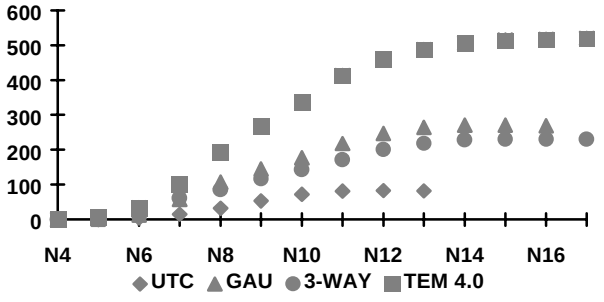

Figure 19. Cumulative data across nodes at $0.70/pound by nodal position from first harvest. Hand-harvest-box-map data.

CUMULATIVE DATA COMBINED HARVEST

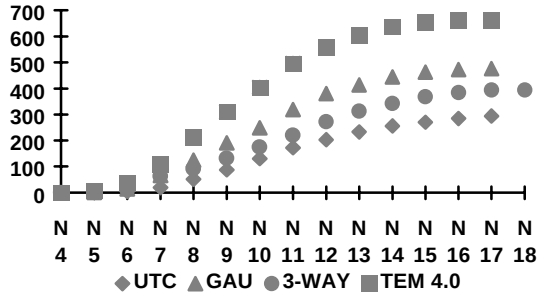

Figure 20. Cumulative data across nodes at $0.70/pound by nodal position from the first and second harvest. Hand-harvest-box-map data.