Title: Use of Dura-Line monofilament as a replacement for high-tensile wire in trellis construction and netting support with small fruit crops

Progress Report

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Extension Proposal

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Objectives:

1) To demonstrate the use of Dura-Line monofilament as a replacement for high-tensile wire for use as cropload wires, catch wires and irrigation line support wires in small fruit crop trellising.
2) To evaluate the use of Dura-Line monofilament as support for crop netting used for bird control in small fruit crops.
3) To develop equipment and methods for use in putting out wires for trellises and netting support in small fruit crops.

Justification and Description:

Support systems (trellises) are used in several small fruit crops (grapes, blackberries, raspberries) to support fruiting canes, as catch wires to orient new growth for optimal light interception and shade prevention in the fruiting zone and to suspend trickle irrigation lines so they are less apt to be damaged in ground maintenance operations.

Bird damage is becoming an increasing problem in most small fruit crops and netting applied prior to fruit ripening and maintained through harvest is becoming more of an economic necessity for many growers. For optimal results, the netting needs to be suspended above the crop canopy.

High tensile steel or aluminum wires of various gauges have been used in trellising and netting support. Wires are expensive to install due to the cost of the material and the difficulty involved in putting it in place and to maintain since they need to be retensioned annually to maintain their proper function. Wires are difficult to handle. They are heavy and can be dangerous due to the recoil that may occur if the wire should break. In addition, wires conduct electricity well so plant damage can be severe in the case of a lightening strike in the planting. Finally, corrosion is a serious concern with uncoated wires or where the coating is damaged as the wire is tightened and secured. Removal and disposal of metal wire when no longer needed can be a problem.

Dura-Line monofilament, manufactured by Bayer, is available in several gauges similar to metal wires for different uses in trellising and netting support. It has been used for several years in many European countries and found to be acceptable under their conditions. Monofilament has a cost advantage over metal wires. With proper equipment and techniques it may be possible to “string” several wires on two rows at the same time resulting in a substantial time savings. Unlike metal wire, monofilament does not require special hardware to secure it on end posts. In the event that it should get broken or cut, splicing it is not a difficult task. When properly installed and tightened, retensioning should not be necessary. Monofilament is much lighter and less prone to dangerous recoil as metal wire if it should break or slip loose while being installed and tensioned. Due to its UV and weather resistance properties, monofilament has held up over 25 years in European vineyards. Other characteristics favoring monofilament are its freedom from corrosion and lack of electrical conductivity. If a planting is removed, the monofilament can be respooled for use at a future time or burned if no longer needed.

Methodologies:

2008

Trellising

Both 12.5 gauge and 8 gauge monofilament lines were installed as the cordon wire on a VSP grape trellis at the Plateau Research and Education Center. High-tensile 12.5 gauge wire was used for comparison purposes. All were tensioned to identical levels using a torque wrench and inline tensioners. An eight-pound weight was hung from the monofilament lines and the high-tensile wire midway between the third and fourth and seventh and eighth line posts. Line sag was recorded for each. This will be repeated in spring to determine how much retensioning is needed for each

Net Support

Demonstrations using 12.5 and 8 gauge monofilament line versus 12.5 gauge high-tensile wire for bird netting support were initiated in blueberry and grape plantings at the Highland Rim, Middle Tennessee and Plateau Research and Education Centers. For net support on individual rows, 24-inch extensions were fastened to end posts and line posts on the trellis. Monofilament line and high-tensile wire were secured to the top of the extensions down the rows to position the net above the crop canopy. Where an entire block was encased in netting as opposed to individual rows, an extra post extending 8 feet above ground and 30 feet out from the end post were set at both ends of the rows and the monofilament lines and wire was extended out to them. Similarly, posts were set 10 feet beyond the outside rows with monofilament line or high-tensile wire at the top to allow netting to extend far enough out from the row to allow for equipment travel within the netted block.

Demonstrations in both trellis and net support using monofilament line instead of high-tensile metal wire were included as part of field day presentations at the Middle Tennessee and Plateau Research and Education Centers.

2009

Trellising

In 2009 instead of using an eight pound weight to determine sag, a scale with a pound scale was purchased. The scale was hooked to the line midway between the third and fourth and the seventh and eight line posts and pulled toward the ground until ten pounds of force was applied to the line. The sag was then measured and compared to the unloaded condition. The difference was the amount of sag. Each type of line (treatment), high tensile wire (HTW), 8 gauge monofilament (DL-8), and 12.5 gauge monofilament (DL-12.5) was replicated twice (1 and 2). Measurements were taken on April 29 and again on October 7. The A position is between the third and fourth post and the B position is between the seventh and eight posts. The values recorded are at table 1.

Table 1. Sag measurements for all three treatments for April and October.

Date	**Treatment**	**Position**	**Replication**	**Sag (inches)**
29 Apr 09	HTW	A	1	5.0
29 Apr 09	HTW	B	1	5.25
29 Apr 09	HTW	A	2	4.625
29 Apr 09	HTW	B	2	4.875
29 Apr 09	DL-8	A	1	4.875
29 Apr 09	DL-8	B	1	5.125
29 Apr 09	DL-8	A	2	4.0
29 Apr 09	DL-8	B	2	4.25
29 Apr 09	DL-12.5	A	1	8.625
29 Apr 09	DL-12.5	B	1	6.25
29 Apr 09	DL-12.5	A	2	8.25
29 Apr 09	DL-12.5	B	2	10.25
7 Oct 09	HTW	A	1	4.5
7 Oct 09	HTW	B	1	4.5
7 Oct 09	HTW	A	2	4.0
7 Oct 09	HTW	B	2	5.0
7 Oct 09	DL-8	A	1	5.5
7 Oct 09	DL-8	B	1	5.5
7 Oct 09	DL-8	A	2	5.125
7 Oct 09	DL-8	B	2	6.0
7 Oct 09	DL-12.5	A	1	12.625
7 Oct 09	DL-12.5	B	1	11.125
7 Oct 09	DL-12.5	A	2	11.125
7 Oct 09	DL-12.5	B	2	11.75

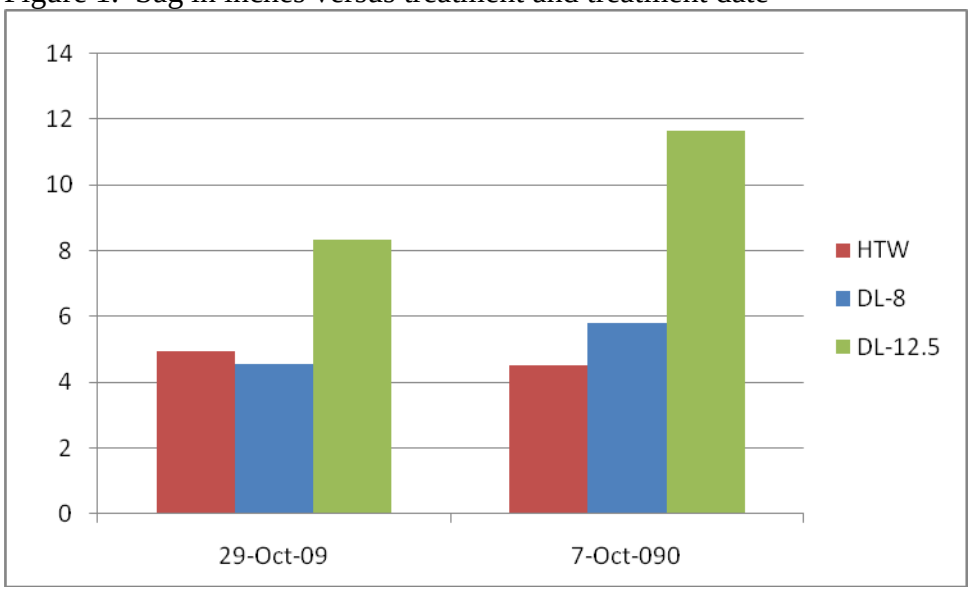
In order to graph the results in a easily visualized manner for each treatment the two positions and the two replications were average to obtain a single value that are represented graphically. The averages used are at Table 2.

Table 2. Average values of sag for each of the three treatments.

Julian Day	HTW	DL-8	DL-12.5
29 Apr 09	4.94	5.56	8.34
7 Oct 09	4.5	5.78	11.65

Figure 1 is a graph of those averages.

Figure 1. Sag in inches versus treatment and treatment date



Results:

2008

Initial results showed that the 12.5 gauge monofilament was equivalent to the 12.5 gauge high-tensile wire. The 8 gauge monofilament exhibited less sag than the 12.5 guage monofilament when used as netting support.

For the netting system over an entire portion of the vineyard, support posts had to be well-anchored to prevent leaning as the monofilament and high-tensile wire were tightened. Netting on grapes were applied prior to veraison and removed within 30 days following harvest. Netting on blueberries was applied in mid-June and remained on until mid-September. During this interval, no differences were detected in sag of the different materials.

2009

From the graph it is apparent the high tensile wire (HTW) and the Dura-Line 8 (DL-8) are similar in ability to resist sag over time. Of course the 8 gauge is significantly heavier than the 12.5 gauge Dura-Line. Also for both the 8 and 12.5 gauge Dura-Line the sag increased slightly between the two measurements. It would be beneficial to determine if the amount of sag increased significantly over a longer period of time and possibly at different times of the year.

Conclusions:

It appears that the 8 gauge Dura-Line is comparable to the high tensile wire in ability to maintain its tension over time. It is simpler and quicker to install. The current price of high tensile wire is approximately $0.03 per foot, 12.5 gauge Dura-line is approximately

$0.02 per foot, and 8 gauge Dura-line is approximately $0.06 per foot. Also, measurements over an extended period of time would provide better insight into the ability of the monofilament to maintain its tension.

A no-cost extension on this project has been requested and granted to enable data collection over a longer time and under varying weather conditions. This should enable a more accurate assessment of the potential for using monofilament in plant support systems.

Impact:
Overall production costs could be lowered by using the 8 gauge monofilament instead of high tensile wire even though the initial cost of the materials would be higher. Without the need to retension wires, money could be saved on parts and labor. Upkeep of the trellis would be simplified for this same reason. Vine losses due to lightening would likewise be reduced with the use of monofilament. The use of the 12.5 gauge monofilament for support systems in caneberries and for catch wires in vineyards would be less expensive than using high tensile wire.

Because monofilament is easier and less dangerous to work with and because multiple lines could be strung at one time during trellis construction, a considerable savings could be recognized.