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Effect of Tray Type and Tray Covering on Wicking Speed, Germination, and Spiral Rooting of Tobacco

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Introduction

Poor tray wicking and spiral rooting continue to be recurring concerns in tobacco float systems. Poor wicking of trays can usually be attributed to old media or media that was improperly stored for extended periods of time. Tray design may also influence speed of wicking. The clay-based pelleting materials used to coat tobacco seeds are thought to cause damage to the emerging root radical under certain conditions, leading to an increased incidence of spiral root. Practices that change the microenvironment at the top of the cell area surrounding the seed may reduce spiral rooting by altering the breakdown of the pellet. Several transplant growers in Tennessee routinely cover trays with a thin fabric such as Reemay® or Continental® fabric as they are floated and remove the fabric 14 to 21 days later in an effort to reduce spiral rooting.

Objectives

The objectives of the research discussed here were: 1) to compare media wicking speed in two types of tobacco float trays, and 2) to evaluate the effect of fabric tray covering on tobacco seed germination and spiral rooting.

Materials and Methods

Experiments were conducted in March 2009 and March 2010 at the Highland Rim Research & Education Center in Springfield, TN. A typical double-layer Poly-covered greenhouse was used with temperatures maintained in a range of 65 F to 82 F. Nitrogen fertility levels were maintained near 100 ppm N throughout the experiments. Trays used were either a standard tray (13.5 in. wide by 26.25 in. long by 2.5 in. deep) or a Beltwide® "shallow" 1.8 low density tray (13.5 in. wide by 26.25 in. long by 2 in. deep). Standard trays were Speedling® trays in 2009 and Burley Gold® trays in 2010. Cell design for the standard Speedling and Burley Gold trays was an inverted pyramid with a square hole in the bottom. The Beltwide tray cell design had a rounded bottom with a round hole. Both tray types were 288-cell. All trays were filled with Carolina Choice® soilless media from a gravity-fed media box and seeded with a 288-cell ABC Quick Seeder® in both years. Tobacco variety used in both years was KT 206LC burley from Rickard Seed. New seed lots were used in each year and initial germination reported was 95% in each seed lot. Immediately following seeding, each type of tray was either floated uncovered as is the standard practice or covered individually with Continental fabric in 2009 and Reemay fabric in 2010, and floated immediately. Fabric was cut to match the tray dimensions of 13.5 in. by 26.25 in. and staples were used along the outer edge of the covered trays to hold fabric in place. All experiments included 4 replications (4 trays) of each tray type/tray cover combination in both years.

Speed of Wicking

Speed of wicking between tray types was evaluated on uncovered trays only. Trays were constantly monitored visually and wicking time required was recorded for each tray until wicking was complete in all trays. Wicking was determined by color change in

the growing media. At 24 hours after floating, the number of dry (unwicked) cells per tray was also recorded. The speed of wicking portion of the experiment was conducted twice in each year. In 2009, speed of wicking was evaluated on non-dibbled trays floated on a sunny day (March 18, 10% cloud cover) and a second time on dibbled trays floated on a cloudy day (March 19, 80% cloud cover). In 2010, all trays were dibbled and speed of wicking was evaluated where trays were floated on a sunny day (March 18, 15% cloud cover) and a second time where trays were floated on a cloudy day (March 25, rainy with 100% cloud cover).

Germination and Spiral Rooting

Fabric on covered trays was removed at 20 days after seeding/floating in 2009 and at 14 days after seeding/floating in 2010. Uncovered trays and covered trays were evaluated for germination and spiral rooting incidence at 20 days after seeding/floating in both years. Cells from the outer cell row (68 cells) of covered and uncovered trays were not evaluated since in covered trays these cells were adjacent to where the edge of the fabric was stapled to the tray which could potentially alter the environment of these cells compared to cells in the middle portions of covered trays.

Results and Discussion

Speed of Wicking

Table 1. Effect of tray type on speed of wicking and dry cells in 2009. Data collected from uncovered trays only.

	Experiment 1: Non-dibbled trays seeded and floated on a sunny day (March 18, 10% cloud cover)		Experiment 2: Dibbled trays seeded and floated on a cloudy day (March 19, 80% cloud cover).	
Tray Type	Time required for complete wicking*	Dry Cells per tray after 24 hrs*	Time required for complete wicking*	Dry Cells per tray after 24 hrs*
Standard Speedling (13.5" x 26.25" x 2.5")	241 min.	9.5	123 min.	0
Beltwide Shallow (13.5" x 26.25" x 2")	54 min.	0.1	55 min.	0

*Indicates that means within column are statistically different.

Table 2. Effect of tray type on speed of wicking and dry cells in 2010. Data collected from uncovered trays only.

	Experiment 1: Dibbled trays seeded and floated on a sunny day (March 18, 15% cloud cover).		Experiment 2: Dibbled trays seeded and floated on a cloudy day (March 25, rainy with 100% cloud cover).	
Tray Type	Time required for complete wicking*	Dry Cells per tray after 24 hrs	Time required for complete wicking*	Dry Cells per tray after 24 hrs
Standard Burley Gold (13.5" x 26.25" x 2.5")	90 min.	0	145 min.	0
Beltwide Shallow (13.5" x 26.25" x 2")	42 min.	0	50 min.	0

*Indicates that means within column are statistically different.

Germination and Spiral Rooting

Table 3. Effect of Continental® fabric tray covering on seed germination and spiral rooting at 20 days after seeding and floating in 2009. No statistical differences between trays or tray covering treatment for germination or spiral rooting.

Tray Type	Tray Covering	% Germination	% Spiral Rooting
Standard Speedling (13.5" x 26.25" x 2.5")	No Cover	94.55	2.96
Standard Speedling (13.5" x 26.25" x 2.5")	Continental fabric	93.98	3.98
Beltwide Shallow (13.5" x 26.25" x 2")	No Cover	92.50	3.07
Beltwide Shallow (13.5" x 26.25" x 2")	Continental fabric	94.43	2.50

Table 4. Effect of Reemay® fabric tray covering on seed germination and spiral rooting at 20 days after seeding and floating in 2010.

Tray Type	Tray Covering	% Germination*	% Spiral Rooting
Standard Burley Gold (13.5" x 26.25" x 2.5")	No cover	93.18	2.62
Standard Burley Gold (13.5" x 26.25" x 2.5")	Reemay fabric	95.46	2.62
Beltwide Shallow (13.5" x 26.25" x 2")	No cover	93.98	3.07
Beltwide Shallow (13.5" x 26.25" x 2")	Reemay fabric	95.91	1.93

*Indicates that means within column are statistically different.

Effect of Tray Type on Speed of Wicking

2009 Experiments

There were differences between the two experiments in the time required for complete wicking of the standard Speedling trays in 2009. These differences could be due to dibbling, cloud cover at the time of floating, or both. Speedling trays dibbled and floated on a cloudy day required approximately half as much time for complete wicking as did Speedling trays not dibbled and floated on a sunny day. There were no differences between the two experiments in time required for complete wicking of the Beltwide trays. Tray type did have a significant effect on time of wicking in both experiments. The Beltwide shallow trays required only 54 to 55 minutes for complete wicking in either experiment, compared to 123 to 241 minutes for the Speedling trays (Table 1).

2010 Experiments

There were differences between the two experiments in the time required for complete wicking of the standard Burley Gold trays in 2010. These differences could be due to cloud cover at the time of floating or other conditions. Unlike in the 2009 experiment, wicking speed of the standard trays was slower in the second experiment where trays were floated on a dark cloudy, rainy day instead of a sunny day. Standard Burley Gold trays required 90 minutes for complete wicking in Experiment 1 (sunny day) and 145 minutes in Experiment 2 (cloudy day). Wicking speed was enhanced with the Beltwide shallow trays in both experiments, where complete

wicking occurred in 42 minutes when dibbled and floated on a sunny day in Experiment 1 and 50 minutes when dibbled and floated on a cloudy day in Experiment 2 (Table 2).

Effect of Tray Covering on Germination and Spiral Rooting

2009 Experiments

Germination and spiral rooting data are shown by tray type and covering treatment (Table 3). There were no effects of tray type or tray covering on germination or spiral rooting incidence. KT 206LC had 92.50 to 94.55% germination and 2.50 to 3.98% spiral rooting at 20 days after seeding and floating regardless of tray type or fabric covering. Germination and spiral rooting levels were considered normal.

2010 Experiments

Germination and spiral rooting data are shown by tray type and covering treatment (Table 4). Unlike in the 2009 experiment with Continental fabric, Reemay fabric covering used in 2010 did have a small but statistically significant effect on germination. KT 206LC in either tray type covered with Reemay fabric for the first 14 days after floating had germination of 95.46 to 95.91% while germination of uncovered trays was 93.18 to 93.98% at 20 days. There were no statistically significant effects of tray type or tray covering on spiral rooting incidence, with spiral root levels ranging from 1.93 to 3.07% at 20 days. KT 206LC in either tray type covered with Reemay fabric for the first 14 days had an average of 2.28% spiral rooting while uncovered KT 206LC in either tray type had an average of 2.85% spiral rooting. Germination and spiral rooting levels were considered normal.

Summary and Conclusions

The results of these experiments suggests that cloud cover at the time of seeding and floating does not consistently influence the speed of wicking in tobacco float trays, as opposing results were seen when floating trays on cloudy or clear days over the two years. Results consistently showed that the Beltwide shallow trays wicked quicker than standard trays. In 2010, Reemay fabric covering resulted in slightly higher germination compared to uncovered trays. However, tray type or tray covering did not influence spiral rooting levels in these experiments with spiral rooting levels considered normal. Tobacco transplant growers speculate that fabric covering could reduce spiral rooting to normal levels in years when spiral rooting levels are high (5% or more). However, based on these data there is no clear reason to recommend that fabric covering be used as a means of reducing spiral rooting.

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