Observations from a 2019 database on Cercospora Leafspot (CLS) inputs Part II: Spray Equipment.

In this second in our series of shareholder database observations of CLS control measures I am going to try to cover the results of queries that dealt specifically with the influence of spray equipment and equipment configurations on CLS control. When it comes to spray equipment choices and selection, many of the options are intimately linked together such that any choice of a given piece of equipment will ultimately necessitate some other equipment choices or completely preclude others in order to obtain a preferred spray volume, travel speed, pressure, or pattern overlap.

Much of what I intend to cover relates to spray nozzles. These factors include nozzle type, spacing, pattern angle, and flow rate. The first of these factors is the ***Spray Nozzle Spacing*** (see table at below). There were not many spacing configurations among the shareholders responding. The primary two responses were 20" and 22" spacing. The factors involved in nozzle spacing relate to nozzle manufacturer recommendations and in matching total boom span to existing equipment. The results of the query indicate the potential advantage to closer nozzle spacing. The advantage related to both a reduced CLS score and increased Revenue per Acre (RPA) The value associated with this feature would likely deal with maintaining leaf coverage by assuring proper pattern overlap in situations when there is boom bounce or when the boom is set too high above the canopy.

Spray Nozzle Spacing

Category	Whole Fields	CLS Rating	Field Health	Weighted						Tons/ Acre	Harvest Acres	Times to Beets	Stand Count
				Rev./Acre	EST	ESA	Sugar	Purity	Brie				
	Cnt			$	lbs.	lbs.	%	%				Yrs	Adj.
20	48	2.8	6.6	$947	267	7,250	15.72	91.3	16.5	27.1	5,924	3.8	45,168
22	53	3.3	6.7	$919	268	7,045	15.80	91.1	16.5	26.3	6,312	5.6	46,495
No Answer	39	3.6	6.7	$858	264	6,661	15.66	90.9	17.2	25.2	4,021	5.7	42,139
Avg of fields inputting:	**3.2**			**$914**	**267**	**7,025**	**15.74**	**91.1**	**16.7**	**26.3**	**16,256**	**5.0**	**44,934**

Another factor relating specifically to the nozzles themselves involves the ***Spray Pattern Angle*** produced by the nozzle orifice (see table found below). Nozzle manufacturers have limited choices involving spray pattern angle and the two angles reported were 80° and 110° with the fields reporting the use of latter vastly outnumbering the fields utilizing the former. Although RPA did not provide a definitive advantage to one nozzle pattern angle or another, there was a clear difference noted regarding CLS rating favoring the 110° angle. Similar to the results shown with nozzle spacing, the advantage to the 110° angle most likely relates to the ability to maintain adequate and effective spray pattern overlap even in situations of excessive boom-bounce and or when speed or other factors prevent proper boom height above the canopy.

Nozzle Angle

Category	Whole Fields	CLS Rating	Field Health	Weighted						Tons/ Acre	Harvest Acres	Times to Beets	Stand Count
				Rev./Acre	EST	ESA	Sugar	Purity	Brie				
	Cnt			$	lbs.	lbs.	%	%				Yrs	Adj.
No Answer	39	3.6	6.7	$858	264	6,661	15.66	90.9	17.2	25.2	4,021	5.7	42,139
110	87	3.0	6.7	$932	267	7,141	15.77	91.2	16.3	26.7	10,851	5.1	46,020
80	14	3.7	6.3	$936	265	7,174	15.68	91.1	17.8	26.8	1,385	2.6	44,537

Yet another component relating to spray nozzles is the ***Nozzle Type*** itself. SMBSC shareholders primarily reported the use of two types of nozzles, Extended Range Flat Fan (XR) and Turbo Teejet (TT) with the vast majority preferring FFs.

The data sort did not identify a clear advantage of one or the other nozzle to RPA (which may have been related to other factors such as stand count). However, with limited fields reporting, the data suggested an advantage to TT nozzles in regard to a reduced CLS score (see table above). Further, water soluble paper (WSP) tests performed in 2019 had also identified a slight advantage to the TT nozzles in overall coverage. Although the TT nozzles appeared to hold an advantage over the FF nozzles in coverage when averaged over the flow rates and pressures utilized in the WSP test, SMBSC asks that caution be exercised with interpretation of these findings because upon closer examination it also appears that TT nozzles were also the most inconsistent relating to certain spray specifics in that they represented both the best and the worst level of coverage when compared to FF nozzles (see table at left). In the table, the "Mean" equals WSP spray coverage and the nozzles followed by the same letter are not significantly different.

CLS Sprayer Nozzle Type

Category	Whole Fields	CLS Rating	Field Health	Weighted						Tons/ Acre	Harvest Acres	Times to Beets	Stand Count
				Rev./Acre	EST	ESA	Sugar	Purity	Brie				
	Cnt			$	lbs.	lbs.	%	%				Yrs	Adj.
No Answer	47	3.5	6.9	$959	268	7,336	15.81	91.1	17.1	27.4	5,653	4.5	44,957
FlatFan	74	3.2	6.4	$898	267	6,891	15.74	91.2	16.2	25.8	8,109	5.6	45,800
TurboTeejet	15	2.6	7.1	$877	263	6,834	15.60	90.9	17.1	25.9	2,111	3.4	42,760

U of NE analysis of nozzles

Nozzle	Mean	Homogeneous Groups
TT11006	56.185	A
XR11006	45.175	AB
XR11005	38.025	B
TT11005	36.820	B

The next topic to be covered in this second installment of the database observations of CLS inputs is ***Aerial Applications.*** Aerial applications provide a challenge for interpretation within the limitations of the SMBSC databases. The special shareholder database relating to CLS fungicide applications indicates a slight advantage to ground rig spraying in regard to reducing CLS score. However, in both the special shareholder CLS database as well as the SMBSC Main Agronomic Practice Database (SMBSC-APD), fields that utilized the use of aerial applications to supplement a ground rig-based program generally provided a $50 to $75 / Acre advantage over those fields that never used an aerial application. This insinuates two potential factors... ***1).*** Assuring fungicide application timeliness with aerial applications during wet periods is MORE valuable than the additional coverage that can be provided by waiting for conditions to be conducive for ground rigs or ***2).*** Aerial applications provide air turbulence that allows spray droplets to penetrate deeper into the canopy or onto the underside of leaves and may have value if used occasionally within a fungicide spray program from a strategic coverage perspective. The photo found to the below provides a visual glimpse of fungicide coverage from an aerial application. The WSP card seen on the left of the photo is from placement near the collection of this leaf and can be used as a comparison. Additionally, the leaf segments in the photo represent both the top and bottom surfaces of the same leaf that has been cut down the center. The leaf portion at the top of the photo represents the top side of the leaf facing upward whereas the leaf portion at the bottom of the photo is of the bottom side of the leaf that faced toward the ground. Note the specks of fungicide coverage on the bottom side of the leaf. This coverage was ***NOT NOTED*** in another portion of the field where the shareholder used a ground rig on the same day and at the same timing as the aerial application. These interpretations and observations however, are both circumstantial and anecdotal. Caution is advised with incorporation.

As a final comment regarding the importance of equipment choices for making CLS fungicide applications, even the best spray equipment from nozzles to pumps will wear over time. New technologies of calibration equipment exist that are designed to make sprayer calibration quicker and easier. They possess sensors and digital read out versus the days of collection and calculation. Sprayers should receive calibration annually. If you have questions about these new and more convenient hand held sprayer calibrators. Contact your SMBSC Agriculturist.

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