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Impacts of sprayer speed on herbicide coverage in desiccation of alfalfa for seed

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Introduction

This publication explains the results of a study conducted near Heart Mountain to answer the question, "Does sprayer speed affect the application of desiccants on alfalfa grown for seed prior to harvest?"

Timely and uniform desiccation of alfalfa plants is essential prior to seed harvest in alfalfa seed fields. Numerous factors can affect desiccation uniformity including crop canopy, weather conditions, application equipment, active ingredient of the herbicide, adjuvants, etc. Herbicide coverage is extremely important, especially contact herbicides such as Paraquat because these chemicals only affect the portion of the plant they touch and not the remainder of the plant.

Our findings indicate ground speed affects the application of desiccants for alfalfa seed plants. Regardless of nozzle type, the travelling speed affects the coverage and the volume of herbicide applied per area. Since alfalfa grown for seed typically uses contact herbicides for desiccation and the alfalfa plant canopy effects spray coverage, optimizing as much spray coverage as possible is vital to ensure a proper burn down of plants for seed harvest.

Figure 1. Case IH SPX 3300 applying desiccant to the test plots.

For uniform and timely desiccation, applications should be conducted at slower speeds to provide the most coverage and highest amounts of chemical possible on the alfalfa plants.

The slower application speeds allowed better desiccant penetration into the plant canopy. As a result, a more effective and uniform burn down of the alfalfa seed field would be expected. These trends were observed regardless of the nozzle type used.

Always calibrate the sprayer for the speed of application to ensure the correct application rate and amount of chemical applied. Always consult the herbicide label and nozzle charts to determine the best combination for the spray rig parameters.

Materials and Methods

The study was conducted in the summer of 2016 near Heart Mountain. Tested treatments were applied using a Case IH SPX 3300 sprayer with a 90-foot boom width (Figure 1). The application rate was kept constant at 50 gal/ac, and the spraying solution consisted of water and the adjuvant Hell-Fire® at 2 qt /100 gal of water for all treatments. Tested treatments included nozzle types and ground speeds. The alfalfa seed producer/owner of the spray rig selected nozzles he utilizes for desiccation applications. The minimum ground speed was set at 5 mph for the first nozzle (AIXR), and the second nozzle (flat fan) was set at 8 mph to keep the spray pressure equal between the two treatments. The maximum speed was determined by the maximum pressure at which the spray rig could operate safely, which was 80 psi. The spray rig automatically sets the operating pressure in accordance to the ground speed to keep the application rate constant.

Application coverage was recorded at three height levels within the alfalfa canopy utilizing Tee-Jet® water sensitive spray cards. Approximate heights were 3 feet for the top, 1.5 feet for the middle, and at ground surface. The Tee-Jet® water sensitive spray cards are yellow and then turn blue once in contact with water droplets (Figure 2). Spray coverage percentage and the applied volume for the area was estimated using the DepositScan® program from USDA.

Results

The coverage percentages for the three canopy heights for all treatments combined was 58 percent at the top, 26 percent in the middle and 14 percent at the ground surface (Table 1). These results suggest the alfalfa plant's canopy structure is an important factor in

Figure 2. Tee-Jet water sensitive cards prior and after treatment.

the amount of desiccant that will penetrate the canopy and reach the lower portions of the plants. Taking this into consideration, the 14-percent coverage observed at ground level can be considered a significant reduction in the level of spray coverage. Since alfalfa grown for seed typically uses contact herbicides, which doesn't translocate within the plant and only affects plant tissue contacted by the herbicide, coverage is paramount to providing the most uniform and timely desiccation prior to seed harvest.

The traveling speed of the sprayer had a significant impact on the overall percent coverage for both of the tested nozzles. The coverage was reduced by 39 percent with a 1-mile per hour increase of the application speed when using the air-induced nozzles (AIXR). Although of lesser magnitude, a reduction in coverage was also observed when increasing traveling speeds when using the flat fan nozzle. This study showed that there was a 39-percent reduction and 18-percent reduction in average coverage of the alfalfa plant when application speeds were increased by 1 mile per hour and 4 miles per hour respectively, using two different nozzles (Table 2). This means ground speed matters regardless of the nozzle type used.

Table 1. Average spray solution coverage (%) for combined test plot canopy heights.

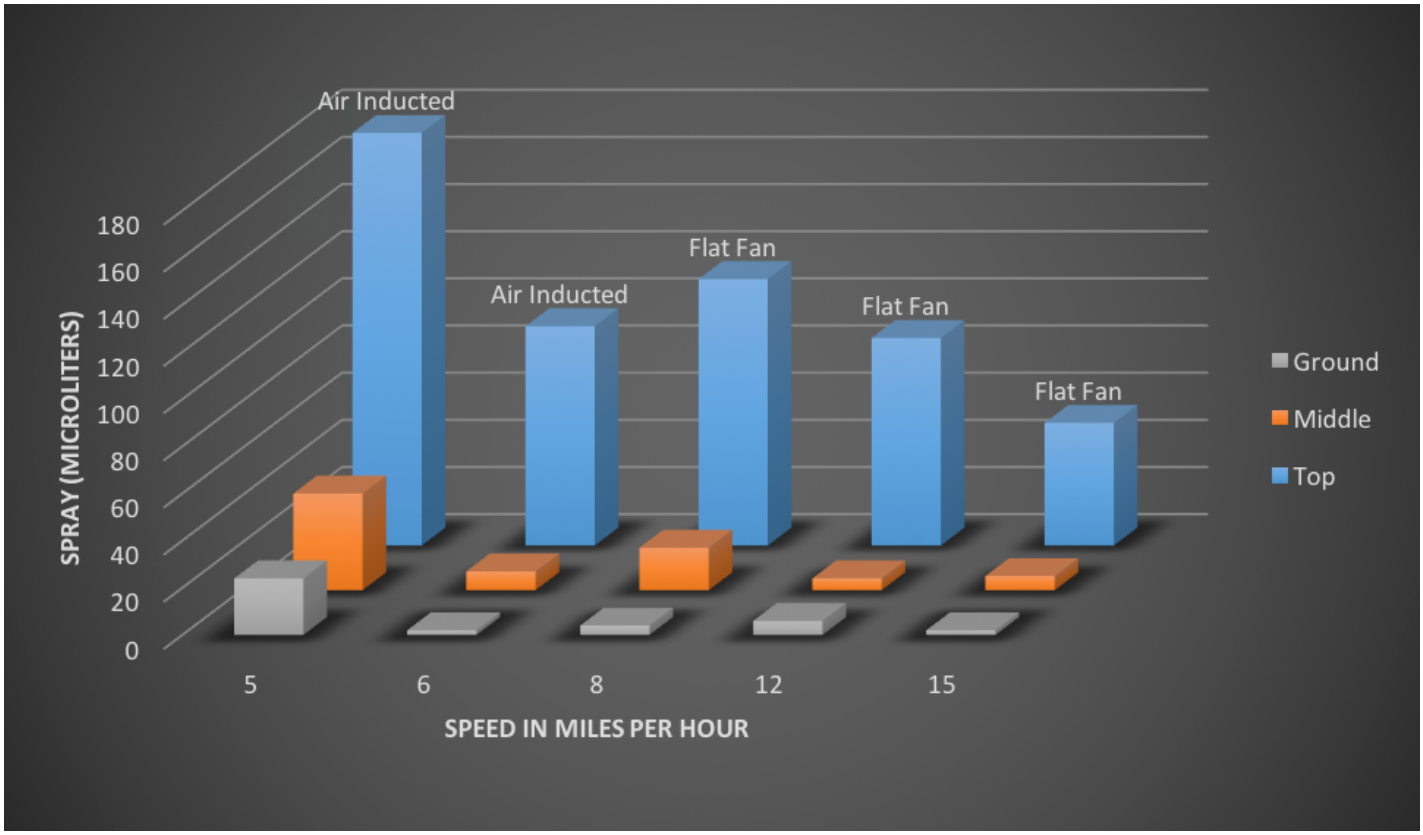
Height	Coverage (%)
H1 (Top)	58
H2 (Middle)	26
H3 (Bottom)	14

Table 2. Average coverage (%) for different treatments and percent coverage reduction for each tested nozzle type.

	Speed	Nozzle	PSI	Coverage (%)	Coverage Reduction
TRT 1	5	AIXR	40	46	39%
TRT 2	6	AIXR	70	28	
TRT 3	8	Flat Fan	40	33	18%
TRT 4	12	Flat Fan	65	27	
TRT 5	15	Flat Fan	80	27	

There was also a significant reduction in the volume applied per area when application speed was increased. For instance, the volume that reached the top part of the canopy with the AIXR nozzles at 5 miles per hour was 175 microliters (µL), and decreased to 93 µL when speed was increased to 6 miles per hour (Table 3). A similar trend was observed with the flat fan nozzles, with 113 µL applied to the area when the travelling speed was 8 miles per hour and only 52 µL when speed was increased to 15 miles per hour. The reduction in the applied volume with increasing travelling speeds was observed at all three canopy levels.

Table 3. Average volume (µL) applied for each treatment for different canopy heights.



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