Spray Swath Analysis/Drift Management

Project No.: **09-WATER1-Stoltz**

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Objectives:

To minimize off target movement and to improve infield efficiency and distribution of almond crop production products.

Interpretive Summary:

Agricultural aircraft were tested to monitor spray pattern variability and drift potential. None of the aircraft tested were out of compliance for pattern variability. Only one of the aircraft tested showed a high propensity to drift. Some showed little potential for drift but may have had droplets too large to give adequate coverage. This information will help improve efficacy, offsite movement by drift, and offsite movement by runoff due to material being on the ground rather than the tree.

Materials and Methods:

Swath analysis is accomplished by a process using the California Agricultural Aircraft Association (CAAA) Fluorometer. The aircraft is loaded with water and Rhodamine Dye. The aircraft flies over and sprays a specially treated string. The string is then analyzed by the Fluorometer. A pattern is displayed and swath variability is determined. If variability is too high (greater than 20 percent), adjustments are made to the spray boom and the aircraft is retested. Also, certain pattern characteristics may indicate a potential to drift. If these are noticed, the usual correction is to shorten the boom length.

Drift potential is measured by flying over a set of Syngenta water sensitive cards. These cards are then scanned and analyzed utilizing the WRK DropletScan System. Data derived provide droplet spectra analysis for Volume Medium Diameter (Dv 0.5), (Dv 0.1), and (Dv 0.9). Dv 0.5 means that half of the spray volume is made up of droplets that size or larger and one half the volume is made up of droplets that size or smaller. Dv 0.1 means that ten percent of the spray volume is made up of droplets that size or smaller and Dv 0.9 means that ten percent of the spray volume is made up of spray droplets that size or larger. Droplets are measured in microns. The other key data relating to drift potential, and possibly the more important one, is the percent of spray volume below 200 microns. This latter information is related to the driftibility to droplets. The lower the volume below 200 microns, the less potential there is for drift.

This study looked at two issues: Swath variability and droplet analysis.

Results and Discussion:

<u>Swath Analysis</u>
All aircraft tested at or below the minimum industry accepted swath variability of 20 percent. Thus, all aircraft would give a uniform distribution of the spray. Therefore, this data is not reported.

<u>Droplet Analysis</u>
Sixty aircraft were tested for those droplet parameters that would indicate a drift potential. Only one exceeded the ten percent of spray volume below 200 microns. It was reconfigured and retested to bring it into compliance with industry standards. The others all met or greatly exceed this industry standard (**Table 1**).

The Dv 0.1 is also an indication of drift potential. The nominal number is 200 microns. If smaller, the potential for drift increases. Generally, those aircraft that had Dv 0.1 below 200 microns tended to have a larger percent of the spray volume below 200 microns. Conversely, those aircraft that tested for larger Dv 0.1 tended to have smaller percentages of the spray volume below 200 microns. This means less drift potential but when droplets become too large, the potential to decrease coverage, and thus efficacy, increases.

While the overall averages are above the optimum droplets sizes, the potential for drift is reduced and the droplet spectra are not overly large so that efficacy may become an issue.

The percent average for spray volume below 200 microns indicates a strong possibility to minimize drift. It should be noted, however, that other factors such as wind speed, humidity, and temperature can also affect drift potential. Therefore, all of these factors must be taken into account when applying almond production products by air.

Table 1. Droplet Spectra Analysis

Air-craft	Dv 0.5	Dv 0.1	Dv 0.9	% < 200 micron
1	529	262	761	2.5
2	461	243	665	4
3	595	267	850	2.5
4	595	277	891	2.5
5	513	267	770	2.5
6	448	244	647	3
7	455	255	673	3
8	440	248	683	3.5
9	459	255	663	1.5
10	507	246	706	2
11	432	230	639	5
12	433	237	662	4
13	504	221	768	4.5
14	434	233	637	5
15	522	239	769	3
16	413	217	573	6
17	460	224	671	4.5
18	541	254	767	4
19	559	270	782	2.5
20	589	287	845	2.5
21	623	275	859	4
22	598	288	843	2.5
23	542	287	777	1.5
24	568	278	818	2.5
25	507	264	795	2.5
26	456	260	664	3
27	420	215	631	6
28	608	261	872	3
29	462	248	672	3.5
30	509	255	760	2.5
31	426	210	669	6
32	395	207	597	6
33	543	260	813	3.5
34	451	238	679	3.5
35	371	223	547	5
36	431	232	656	4
37	559	293	782	1.5
38	401	225	591	5
39	405	216	576	5
40	449	225	707	4.5
41	503	233	782	3
42	545	285	781	2.5
43	638	335	859	2
44	417	224	648	5
45	548	272	797	2.5
46	400	208	625	5.5
47	570	298	825	1.5
48	503	245	842	3.5
49	360	196	511	7
50	448	246	618	3.5
51	449	245	636	3.5
52	408	197	608	6
53	470	236	700	4.5
54	564	280	822	1.5
55	651	400	864	3.5
56	648	372	863	5
57	370	187	551	7.5
58	375	203	555	6
59	294	165	443	12.5
60	349	181	519	7.5
Mean	479	249	708	3.9
Opti-mum	400	200-250	600	10