



drone facts



Nozzle Tip and Sprayer Setting Selection for Drift Reduction in the DJI AGRAS MG-1/1S Sprayer Drone

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The DJI AGRAS MG-1/1S is a commonly sold spray drone with a 2.5-gallon tank and 10-minute flight time. Because of its small size, the drone's main use in the U.S. will be for herbicide work on levees, fence rows, hill sides, ravines, swamps, wetlands, right of way easements and horticultural areas. Still, spraying in these areas will require a spray system with low drift qualities as susceptible crops, plants, gardens and other foliage maybe located nearby. Testing with the DJI drone has indicated that high drift rates (greater than 20% of the application rate) can easily occur. For this reason, the LSU AgCenter has been evaluating ways to reduce drift from this drone, and the following recommendations are given as methods to achieve this result while still maintaining a good droplet size for low volume application work of less than 2 gallons per acre (GPA).

Nozzle Selection

The factory XRI1001 tips supplied with the drone are known to create more drift than most other nozzle types (see LSU AgCenter publication No. 3632: Nozzle tip selection for drift control). For this reason, several air induction (A.I.) flat fans were chosen for the testing on the drone and are typically better than XRs for drift control. The A.I. flat fans tested on the drone were the Greenleaf AMI1001, which matched factory orifice sizes, and the TeeJet AIXRI10015 and AIXRI1002 nozzles. In all tests, A.I. nozzles greatly reduced drift with the drone by up to 60% over the standard XRI1001 nozzles. In individual tests, the AIXR nozzles (both the 10015 and 1002) were too coarse for low volume application work less than 2 GPA. At these low levels, the AMI1001 nozzles (0.01 GPM orifice size) had a much better droplet spectrum (Figure 1; $V_{md} = 301$ micrometers [μm]) for low-level application rates (2 GPA). For this reason, the Greenleaf AMI1001 and similar A.I. flat fans are recommended for use on this drone.

Sprayer Settings

During testing, it was noticed that two sprayer settings can easily cause excessive drift. These two settings are the "efficiency" and "effective" modes, which relate to the percentage of area covered by the drone and the area covered at the fastest spraying speed (15 mph), respectively. Many users are enticed into choosing 100% for this value, thinking they are performing a more "effective" spraying operation. However, they are actually choosing the fastest possible spraying speed (15 mph), which always causes more drift. For this reason, choosing lower efficiency/effective rates (less than 50%) will help reduce drift (Figure 2). Also, the AMI1001 air induction flat fans scored better at reducing drift (Figure 2) than the XRI1001 nozzle tips.

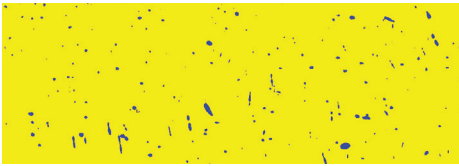
Effective Swath Width

The effective swath width of the DJI AGRAS MG-1/1S drone is not well known or documented. Multiple passes were flown over a dye pattern test string at 10-, 20- and 28-foot swath widths, and results indicated that the drone had a solid 10-foot swath width. Major skips occurred at the 20- and 28-foot swath widths for both tips. The AMI1001 nozzles had a more uniform coverage than the XRI1001 nozzles with a C.V. (coefficient of variation) of 0.12 versus 0.22 for the XRI1001 nozzles. For this reason, the AMI1001 and similar nozzles are recommended for this drone.

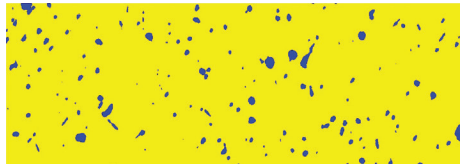
Using these recommendations, the DJI MG-1/1S plant protection drone can be setup to have much better drift reduction (up to 60%) and spray qualities over the factory nozzles XRI1001 nozzles and should be used in areas where drift reduction is a concern.

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XRI1001 (Std. Flat Fan)



AMI1001 A.I. Flat Fan



AIXRI10015 A.I. Flat Fan

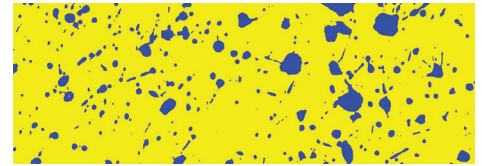


Figure 1: Example droplet cards from three different nozzles.

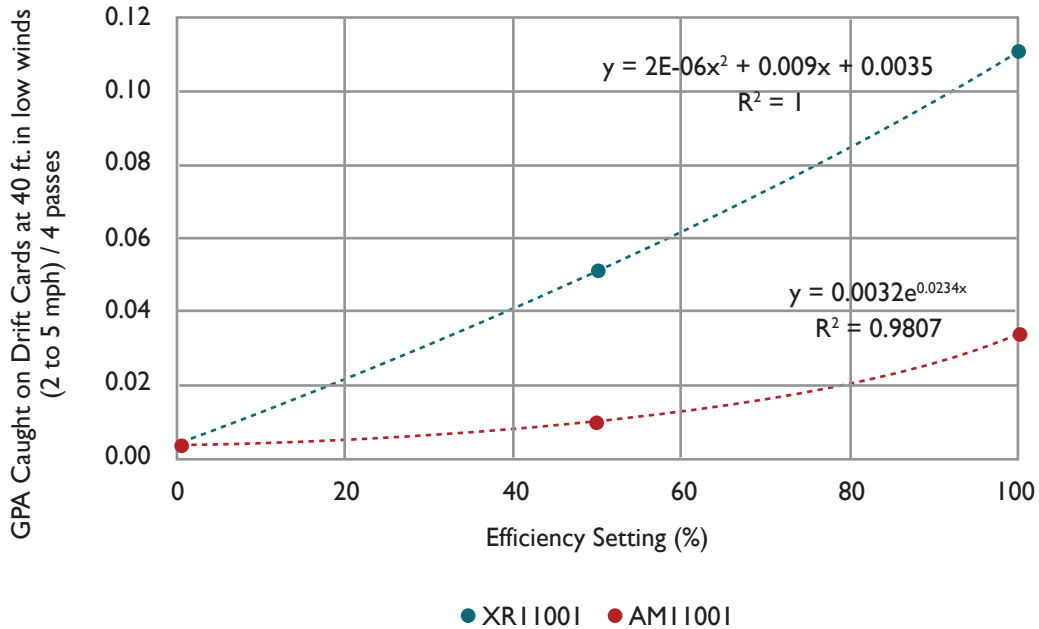


Figure 2: Drift recorded 40 feet from the flight line in light winds (less than 5 mph) for the DJI MG-1/1S drone operated at three different “efficiency” modes.

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