

Liquid physical properties and droplet size in clethodim applications



Marcella Guerreiro de Jesus, Jesaelen Gizotti de Moraes, Greg R. Kruger
Department of Agronomy & Horticulture, University of Nebraska-Lincoln



Introduction

The shape of a liquid droplet is determined by the surface tension of the liquid. This intermolecular force of a liquid at the surface is called the surface tension (ST), and it is responsible for the shape of liquid droplets. The surface wettability may change depending on the contact angle (CA) as the solid and liquid interfaces interact. A small CA results in high wettability while a large CA results in low wettability.

Objective

The objective of our research was to evaluate the result of CA and ST for different tank-mixtures.

Materials & Methods

- Conducted using an optical tensiometer, OCA 15EC (DataPhysics Instruments GmbH, Filderstadt, Germany) at the Pesticide Application Technology Lab
- Solutions:
 - Clethodim (SelectMax)- 126 g ha⁻¹ and 336 g ha⁻¹
 - Low rate of clethodim (126 g ha⁻¹) plus dicamba (Clarity at 280 g ha⁻¹)
 - High rate of clethodim (336 g ha⁻¹) plus dicamba (280 g ha⁻¹).
 - All solutions contained NIS at 0.25% v v¹.
 - Application volume of 94 l ha⁻¹.
- To measure CA, three different droplet sizes were used (500, 1000, and 1500 μm). They were also measured on two contact surfaces (Mylar card and corn leaf) which resulted in a total of 24 treatments.



Figure 1. Examples of the droplet size and contact angle measurement.

- The ST, expressed as mNm⁻¹, was determined following the pendant drop-method (drop hanging on a needle) with three replications per treatment.



Figure 2. Examples of surface tension measurement.

- Data were subjected to ANOVA and means were separated using Fisher's Protected LSD test with the Tukey adjustment.

Results & Discussion

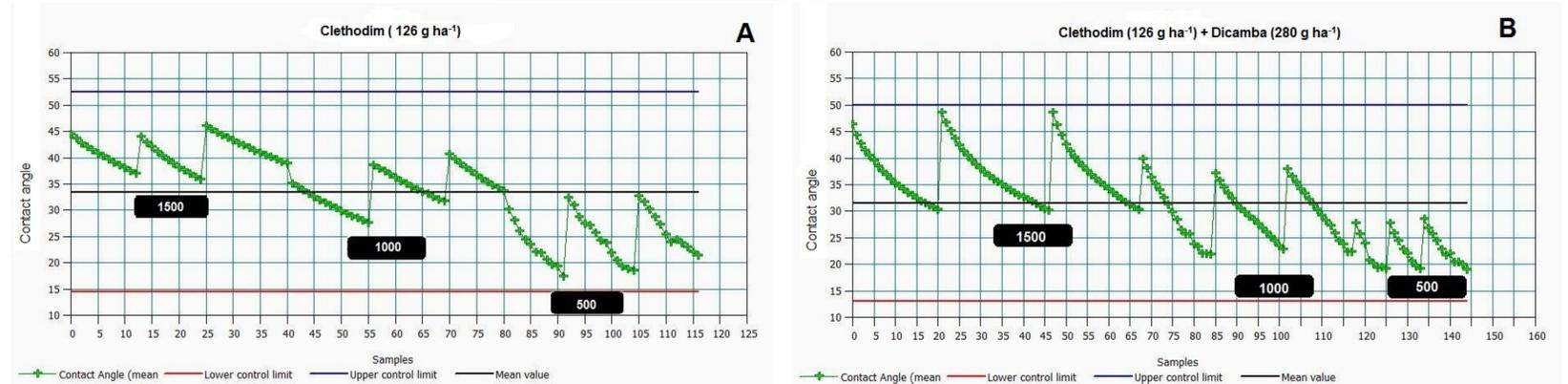


Figure 3. Contact angle on Mylar card with different droplet size for 126 g ha⁻¹ of Clethodim (A), 126 g ha⁻¹ of Clethodim + 280 g ha⁻¹ Dicamba (B).

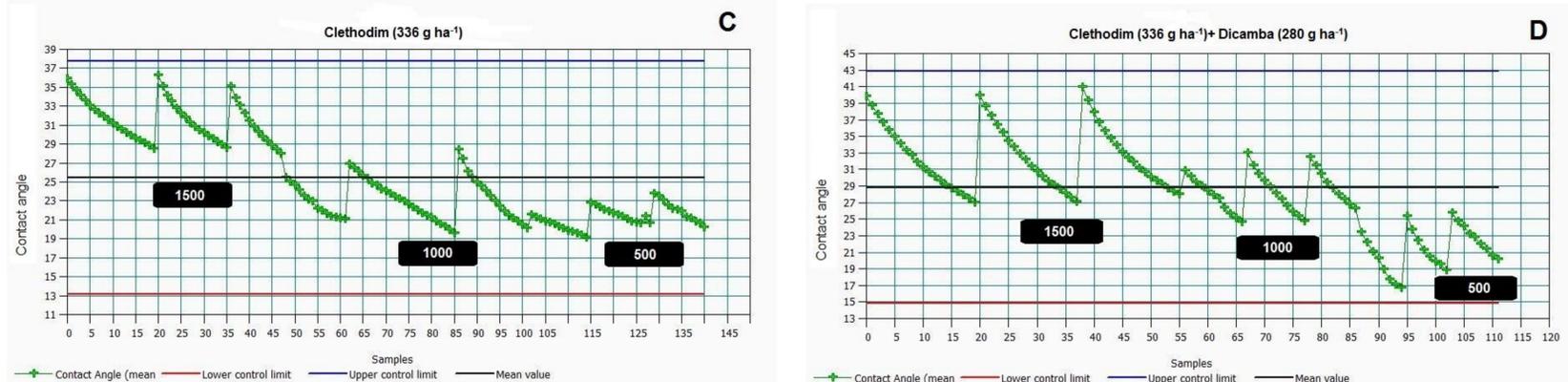


Figure 4. Contact angle on Mylar card with different droplet size for 336 g ha⁻¹ of Clethodim (C), 336 g ha⁻¹ of Clethodim + 280 g ha⁻¹ Dicamba (D).

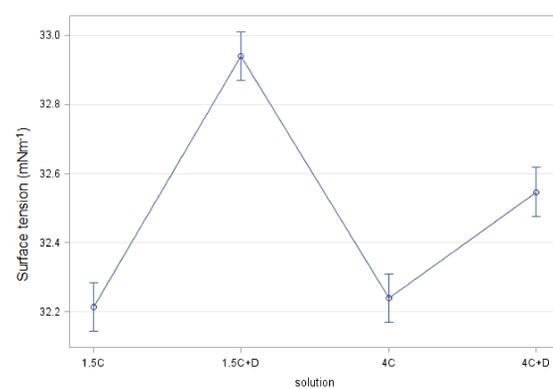


Figure 5. Surface tension (ST) with 126 g ha⁻¹ of clethodim (126C), 336 g ha⁻¹ of clethodim (336C), Clethodim+Dicamba (126C+D) and Clethodim+Dicamba (336C+D).

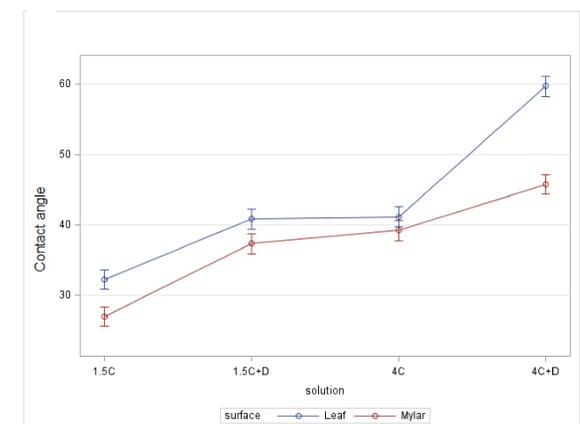


Figure 6. Contact angle (CA) with 126 g ha⁻¹ of clethodim (126C), 336 g ha⁻¹ of clethodim (336C), Clethodim+Dicamba (126C+D) and Clethodim+Dicamba (336C+D).

Conclusions

Previous studies have not mentioned differences in CA as droplet size changes; however, when working with small droplets, in the case of this work, it was an important variable influencing CA. Dicamba added to the tank-mixture caused an increase in surface tension and contact angle, therefore less surface wetting occurs, potentially reducing the efficacy of the clethodim. More research is needed to explain the variation of CA and ST from smaller droplets.

Literature Cited

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- J.H. Snoeijer, B. Andreotti, *Phys. Fluids* **20**, 057101 (2008).