Surface tension, spray deposition and volunteer RR© corn control by clethodim and quizalofop associated with adjuvants

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ABSTRACT

Adjuvants mayimprove control efficiency of volunteer RR® corn with ACCase inhibiting herbicides. Thus, the aim of this study was to evaluate the effects of adjuvant addition to the herbicides clethodim and quizalofop, on surface tension, spray deposition and efficiency of volunteer RR® corn control. The surface tension of clethodim (96 g a.i. ha^{-1}) and quizalofop (60 g a.i. ha^{-1}) herbicides with and without a mineral oil, a vegetable oil and an organosilicon adjuvant was evaluated at concentrations of 0.01; 0.05; 0.1; 0.5; 1.0 and 2.0% v v^{-1}. To evaluate deposition and visual control efficiency, the same herbicides associated or not with the mineral oil (0.5% v v^{-1}), the vegetable oil (0.5% v v^{-1}) and the organosilicon adjuvant (0, 05% v v^{-1}) were used. For this, volunteer RR® corn plants were grown in a greenhouse until stage V2-V3. The adjuvants reduced the surface tension of the herbicides clethodim and quizalofop, organosilicon was the most efficient. Adjuvants does not alter spray deposition of herbicides on corn plants. Mineral oil increases potential control of clethodim herbicide and anticipates control with quizalofop herbicide.

Keywords: ACCase inhibitors; mineral oil; vegetable oil; surfactant.

INTRODUCTION

Volunteer corn plants, from grains lost during harvest, can affect the development of a crop and in this context are classified as weeds (Marquardt & Johnson, 2013). However, the commercial introduction of the glyphosate tolerant corn (Roundup Ready-RR®) increased the management difficulties where other crops, also RR®, are cultivated after RR® corn. On soybean crop, it was already been found losses in productivity up to 70% when the management of volunteer plants is absent (Alms *et al.*, 2016; Braz *et al.*, 2019) and the economic losses level are estimated in 0,48 plants m^{-2}, showing high capacity to cause damage, even when in low densities (Aguiar *et al.*, 2018).

As an alternative, gramicides herbicides, inhibitors of the enzyme acetyl-CoA carboxylase (ACCase) control volunteer RR® maize plants, in applications that precede sowing or after the emergence of eudicotyledons RR® crops. However, there are striking differences in efficiency among different chemical groups of this herbicides (López-Ovejero *et al.*, 2006; Barroso *et al.*, 2010). Haloxyfop herbicide showed better effectiveness control than clethodim on volunteer corn at V8 stage (Costa *et al.*, 2014). Carvalho *et al.* (2019) found that sethoxydim herbicide provided better control efficiency on volunteer corn plants, at V3-V4 stages, when compared to haloxyfop and clethodim.

The association of adjuvants with ACCase-inhibiting herbicides has been recommended by most manufacturers and has shown positive effects in researches. These substances can reduce the solution surface tension, increase

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droplet contact surface with biological target, modify volumetric and numerical median diameter and improve aspects such as coverage, deposit and liquid spreading on plant surface (Castro *et al.*, 2018; Machado *et al.*, 2019). Among these characteristics, surface tension is an important property since it can influence on adhesion and retention of spray solution on the foliar surface and interfere on absorption processes, (Cunha *et al.*, 2017).

As a result, there are several adjuvants belonging to different functional classes that raise doubts for producers and field technicians regarding the choice. In this sense, mineral oils are efficient in minimizing the percentage of drift in the application and assisting in the penetration of the active ingredient (Oliveira Neto *et al.*, 2018). Also, according to the authors, the surfactants group has as its main characteristic the reduction of the spray application surface tension, favoring leaf coverage and, finally, vegetable oils can act to reduce the spray solution surface tension and potential for spray droplets to drift.

As a result, there are several adjuvants belonging to different functional classes that arises doubts in producers and field technicians when choosing an adjuvant. Considering the necessity of studying the interaction among the ACCase inhibiting herbicides and adjuvants, the aim of this study was to evaluate the effects of adjuvant addition to clethodim and quizalofop herbicides, on surface tension, spray deposition and control efficiency of volunteer RR® corn.

MATERIAL AND METHODS

The study was conducted at the Sao Paulo University in Botucatu, Sao Paulo state, Brazil. The study was divided in three steps: surface tension, deposition and effectiveness of the herbicides clethodim and quizalofop, isolated and mixed with adjuvants

Surface tension (ST)

Surface tension was evaluated in a completely randomized design with 38 treatments in four repetitions. The treatments correspond to the herbicides clethodim (96 g a.i. ha^{-1}) and quizalofop (60 g a.i. ha^{-1}) isolated and associated with Argenfrut®, Natur'l óleo® and Silwet L-77® adjuvants, at six concentrations (0,01; 0,05; 0,1; 0,5; 1,0 and 2,0% v v^{-1}), described on Table 1. The herbicides concentration was equivalent to 200 L ha^{-1} application rate, according to Castro *et al.* (2018).

Table 1: Commercial product, active ingredient, concentration, formulation and type of pesticide utilized on each treatment to evaluate surface tension

Comercial product[1]	Active ingredient	Concentration a.i. (g L^{-1})	Formulation	Type
Select®	clethodim	240	EC*	Herbicide
Panther®	quizalofop	120	EC*	Herbicide
Argenfrut®	aliphatic hydrocarbons, mineral oil	845,75	EC*	Fungicide, insecticide and acaricide
Natur'l óleo®	fatty acid esters, vegetable oil	930	EC*	Insecticide and spreader sticker
Silwet L-77®	polyester and silicone copolymer	1000	DC**	Spreader sticker

*Emulsifiable Concentrate; ** Dispersible Concentrate.[1] Citation of trade names does not indicate the author's recommendation or consent.

The static surface tension of the emulsions and solutions containing the pesticides were determined by gravimetric method, measuring the droplet mass formed on the tip of a burette in 20s with a precision scale (d = 0,0001g), as described by Mendonça *et al.* (1999). To avoid losses by evaporation, the droplets were weighted in a Beaker containing a thin layer of vegetable oil. The burette calibration was performed with deionized water and the water surface tension considered 72,6 mN m^{-1} (Mendonça *et al.*, 1999). Five droplets mass constituted each repetition.

Analysis of spray deposition and volunteer RR® corn control

The experimental design was completely randomized. The treatments distributed on factorial 2 × 4, herbicides clethodim (96 g a.i. ha^{-1}) and quizalofop (60 g a.i. ha^{-1}) mixed or not with the adjuvants mineral oil Argenfrut® (0,5% v v^{-1} - Agrovant), vegetable oil Natur'l óleo® (0,5% v v^{-1} - Stoller) and organosilicon Silwet L-77® (0,05% v v^{-1} - Momentive), in five repetitions. Each repetition was represented by two pots with two corn plants each. One of the vases was utilized to control efficiency evaluation and the other to quantify spray deposition. Were performed two replications of this assay in January and May, 2018.

The plants were cultivated in greenhouse in vases with 1,7 L filled with commercial substrate (Carolina Soil®), composed of sphagnum peat, expanded vermiculite, dolomitic limestone, agricultural plaster and NPK fertilizer. The pH at 5.5 (± 0.5); electrical conductivity of 0.7 (± 0.3) mS cm^{-1}; density (humidity 50%) = 145 kg m^{-3} and CTC = 1200 mmolc dm^{-3}, as described by the manufacturer.

The corn seeds used was from 30A37 Morgan® hybrid, sown at 0,8 cm to 1 cm deep, utilizing four seeds per pots. After the plants emerged a thinning was carried out leaving two plants per vase. The pots were irrigated daily, with a sprinkler irrigation system installed in the greenhouse. During the assay, there was not necessary any complimentary insecticide, fungicide application or nutrient fertilization. Herbicide spraying was performed when corn plants was at V2-V3 stages.

The treatments were sprayed in a system, located in a closed and controlled environment, displacement velocity and pressure control, equipped with a spray bar containing six flat fan nozzles AXI 11002 (Jacto®) model, spaced by 0,5 m and positioned 0,5 m high relatively to the plants. The pressure was 345 kPa, pressured by compressed air and the displacement velocity was 1,4 m s^{-1}, obtaining 200 L ha^{-1}. The temperature measured during the spray application ranged from 26 ± 1,5 °C and relative humidity was 74 ± 1%. To evaluate spray deposition, Brilliant Blue dye was added (FD&C-1, Duas Rodas®) at 1,5 g L^{-1} concentration, according to modified method, proposed by Bauer & Raetano (2000). To quantify the deposit, immediately after the application of treatments, two upper leaves of each plant were collected. As a standardized criterion, the leaves that were fully spread were chosen and were later individually packed in plastic bags.

After, 25 mL of distilled water were added to each plastic bag and shacked manually for 30 seconds to remove the dye from the leaves. The absorbance value of the liquid resulting from the plastic bags were determined in a spectrophotometer (Shimadzu UV-VIS 1601 PC®) at 630 nm wave length. In the next step, the leaves were removed from the plastic bags and had the its area measured by LI-3100C Area Meter®. For each spray solution, a standard curve was established, with 12 know dye concentration and its related absorbance values, was created a linear equation to determine the dye concentration in mg L^{-1} present in the spray solution of each treatment. With the concentration data, the amount captured by the target was determined, in µL, by the equation (E1)

$$V_i = \frac{C_f \, .V_f}{C_i} \, .1000 \qquad \text{(E1)}$$

Where,

Ci – Dye concentration of the spray solution (mg L^{-1});

Vi- Amount captured by the target (µL);

Cf- Dye concentration detected by spectrophotometer resulting from linear equation (mg L^{-1}); and

Vf – Volume of distilled water utilized to remove the dye from the leaves (mL).

The amount of spray solution retained on leaves were divided by foliar area (cm^{-2}) to determine the specific spray deposition per foliar area (µL cm^{-2}).

Visual control evaluations were performed on day 7, 14 and 28 after the application (DAA). In the visual control volunteer RR® corn evaluations, a percentage grade scale was used, where 0 corresponds to no injury and 100 to the plant death (SBCPD, 1995).

Statistical analysis

Normality of all data was verified by Shapiro-Wilk test ($p \leq 0,05$). To spray deposition and control, a factorial analysis of variance by F test ($p \leq 0,05$) was applied and the means were compared by Tukey's test ($p \leq 0,05$). Surface tension data of each herbicide was submitted individually to analysis of variance and when significative, the regression was adjusted by modified Mitscherlich method, according to Montório *et al.* (2005).

$$Y = T_{água} - A \,.\left(1 - 10^{-C\,.\,X}\right) \quad \text{(E2)}$$

Where:

Y - Surface tension, in mN m^{-1};

$T_{herb\,-}$ A - Corresponds to the minimum surface tension that the herbicide solution can reach with the adjuvant, in mN m^{-1};

T_{herb} - Corresponds to the surface tension of the solution herbicide, without the addition of adjuvant, in mN m^{-1};

C - Corresponds to the surfactant efficiency obtained directly from the modified model equation;

X - Surfactant concentration, in percent (%).

RESULTS AND DISCUSSION

Surface tension (ST)

Regression analyzes about the surface tension (ST) (mN m^{-1}) of herbicide solutions mixed with adjuvants at different concentrations were significant by Mitscherlich model (Table 2).

Table 2: Results from analysis of variance and regression, with parameters obtained from Mitscherlich model equation with the herbicides clethodim and quizalofop mixed with different adjuvants

Herbicide	Parameters from Mitscherlich mode	Adjuvants		
		Argenfrut®	Natur'l óleo®	Silwet L-77®
Clethodim	A	12,8345	11,3255	21,0855
	C	0,4027	1,8909	40,1252
	M.T	29,5155	31,0245	21,2645
	F	636,8043**	1655,6327**	11735,6347**
	r^2	0,9992	0,9999	0,9983
Quizalofop	A	3,6836	3,4815	13,4707
	C	0,1587	1,5625	15,1232
	M.T.	28,5064	28,7085	18,7193
	F	93,7624**	731,4583**	6532,3502**
	r^2	0,9999	0,9999	0,9994

**Significant at ($p \leq 0,01$). M.T = minimum tension.

Clethodim results showed that the addition of adjuvants resulted in reduction of surface tension ST (mN m^{-1}) in all concentrations tested, with greaterr performance of the organosilicon Silwet L-77® that provided a 53% decrease (19,85 mN m^{-1}), compared to herbicide alone (Figure 1). The high capacity of surface tension reduction of trisiloxane surfactants is widely reported in the literature (Wang *et al.*, 2015; Prado *et al.*, 2016; Castro *et al.*, 2018).

ST results from the adjuvants Argenfrut® and Natur'l óleo® were similar at 1% concentration, however, at 0,5% v v^{-1} the vegetable oil showed more efficiency on ST reduction (32,85 mN m^{-1}) than mineral oil. Argenfrut® demonstrated high ST reduction in the highest concentration analyzed (2,0%), similar to ST values of vegetable oil, 30,82 and 30,61 mN m^{-1}, respectively. It is important to say that ST is not a result only based on oil origin (mineral or vegetable), but also the quality and quantity of emulsifiers added to formulation (Mendonça *et al.*, 2007).

The surfactant Silwet L-77® reached minimum ST at concentration near to 0,1%; however, vegetable oil needed a concentration of 1,0% and mineral oil over 2,0% to reach its minimum surface tension. Another important variable obtained from Mitscherlich model equation consists of parameter "C", where the higher its value is, the lower the static surface tension obtained by the adjuvant at a lower concentration will be. Thus, Silwet L-77® showed higher efficiency to achieve minimum surface tension, followed by Natur'l óleo® and Argenfrut® (Table 2).

The herbicide quizalofop showed lower ST value when compared to clethodim (32,19 mN m^{-1}), both without adjuvants. These differences may be related to the composition of the herbicides, since the additives contained already in the formulation may change the physical-chemical characteristics (Hunsche & Noga, 2012).

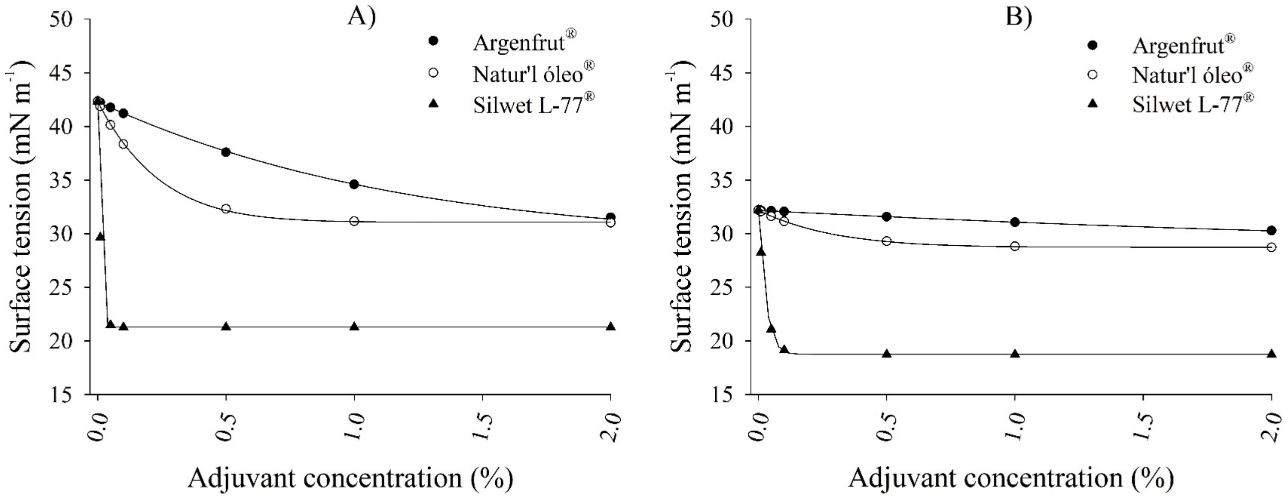


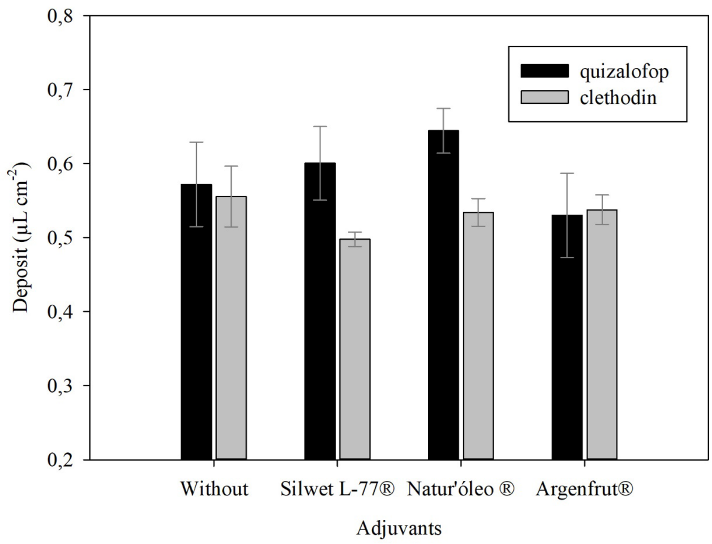
Figure 1: Surface tension (mN m^{-1}) of spray solutions containing the herbicides clethodim (A) and quizalofop (B) alone or with different concentrations of adjuvants.

However, the addition of mineral oil and vegetable oil resulted in ST decrease as from 0,1 and 0,05% concentrations, respectively. The surfactant Silwet L77®, as observed before, guaranteed higher ST reduction, 18,02 mN m^{-1}, at the highest concentration, as well as the highest value of the parameter "C" (15,02) and reached minimum surface tension (18,72 mN m^{-1}) at 0,5% concentration (Table 2).

Minimum surface tension observed for the other adjuvants was similar, showing greater static surface tension reduction. However, there was a difference regarding parameter "C", showing, the vegetable oil, the highest value (1,56). Mendonça *et al.* (1999) found that the oils utilized as adjuvants does not have high value of parameter "C", therefore these adjuvants are not as effective in reducing TS in lower concentrations.

Spray deposition

The addition of adjuvants did not alter the spray deposition values of the herbicides on RR® corn plants leaves (Figure 2). Literature reports that the effects of the adjuvants has been variable depending on many factors, among them, the target characteristics, meteorological conditions during spraying, interaction with pesticides, and spray technique applied. Thus, adjuvants do not always improve spray deposition of pesticides on the target (Maciel *et al.*, 2010; Castro *et al.*, 2017; Castro *et al.*, 2018).



Bars represent the standard error. Coefficient of variation = 15,74%, $F_{herbicide}$ = 3,99^{ns}, $F_{adjuvants}$ = 0,73^{ns} and $F_{herbicide}$ x $F_{adjuvants}$ = 1,16^{ns}. ^{ns}: not significant by the F test at 5% probability.

Figure 2: Effect of different herbicides without or mixed with adjuvants on spray deposition (µL cm^{-2}) on volunteer RR® corn leaves.

In this study, despite adjuvants does not interfere on spray deposition, other parameters may have been optimized using these products. As an example, some adjuvants can assist on droplet spreading on leaf surface and increase absorption and translocation of the active ingredients in plants (Baur & Aponte, 2014; Palma-Bautista *et al.*, 2020), ensuring increased efficiency of herbicides in weed control.

Efficiency of herbicides mixed with adjuvants on volunteer RR® corn control

Seven days after application (DAA), the treatments with herbicides provided low levels of volunteer RR® corn control, ranging from 27,2 and 32,9%, without any difference among the herbicides clethodim and quizalofop (Table 3).

Table 3: Control efficiency (%) of the herbicides clethodim and quizalofop mixed with adjuvants on volunteer RR® corn (1st replication). Botucatu, SP, 2018

Treatment	Control (%) – 1st replication					
	7 DAA		14 DAA		28 DAA	
	clethodim	quizalofop	clethodim	quizalofop	clethodim	quizalofop
Without adjuvants	32,6 ab	28,2 b	49,0 bB	69,0 bA	87,0 bB	98,8 aA
Argenfrut®1	39,2 a	39,2 a	78,0 aB	90,6 aA	98,6 aA	100,0 aA
Natur'l oleo®2	32,4 ab	27,2 b	51,6 bB	83,4 aA	88,6 bB	99,6 aA
Silwet L77®3	31,6 b	32,0 ab	46,4 bB	91,7 aA	86,0 bB	100,0 aA
$F_{herb \times adj}$	$1{,}18^{ns}$		$7{,}58^{**}$		$27{,}32^{**}$	
F_{herb}	$2{,}96^{ns}$		$111{,}97^{**}$		$320{,}21^{**}$	
F_{adj}	$10{,}57^{**}$		$16{,}54^{**}$		$32{,}29^{**}$	
CV (%)	12,89		11,71		1,78	

Means followed by the same uppercase letters (line) and lowercase (column) do not differ on Tukey's test (p ≤ 0,05). ns: non significative; * significative (p ≤ 0,05); ** significative (p ≤ 0,01), by F test.; [1]mineral oil; [2]vegetal oil; [3] organosilicon. CV: coefficient of variation.

Regarding the effects of adjuvants, at 7 DAA only the mineral oil increased weed control when compared to the clethodin and quizalofop herbicides without adjuvants. Mineral oil adjuvants have the capability to help penetration process of active ingredient in plant cuticle (Aref *et al.*, 2017). This fact may have contributed to the earlier occurrence of visual symptoms of the herbicidein RR® corn plants.

At 14 DAA, the herbicide quizalofop provided better control than clethodim, regardless of the presence of adjuvants. Differences among ACCase inhibiting herbicides on many weed species are reported in literature. For example, the efficiency of the herbicide sethoxidim was lower than clethodim and haloxyfop for the control of volunteer RR® corn, at V4-V5 and V7-V8 growth stages (Carvalho *et al.*, 2019). The herbicide haloxyfop promoted greater control efficiency than clethodim in RR® corn, at V8 growth stage (Costa *et al.*, 2014). Pertile *et al.* (2018) found greater control of RR® corn at V6-V8 growth stage by the herbicides haloxyfop and fluazifop when compared to clethodim and sethoxidim. The differences among ACCase inhibiting herbicides reinforce the importance of researches that seek to identify the best active ingredient for each specific situation.

Still at 14 DAA, there was significant interaction among the factors herbicide and adjuvant, showing that the response from RR® corn was dependent on the type of adjuvant. For quizalofop herbicide, all adjuvants increased the level of control in relation to the treatment without application, however there was not difference among the adjuvants.

It is worth mentioning that the use of adjuvants provided the herbicide quizalofop the capability over 80% control at 14 DAA, which is considered satisfactory for post emergence herbicide treatment on weed plants (SBCPD, 1995). For treatments using the herbicide clethodim, only the mineral oil adjuvant provided greater control than the herbicide alone, increasing 29%. However, does not reached satisfactory control (78%), at this time.

The last evaluation, at 28 DAA, the herbicide quizalofop provided greater control than clethodim, with exception of treatments that used mineral oil, where the herbicides did not differ from each other. This results show that without the use of mineral oil, the herbicide clethodim shows lower efficiency than quizalofop.

When comparing the treatments with the herbicide quizalofop, any adjuvant provided efficiency increase in relation to the herbicide alone, because all of them showed control equal or near to 100%. This result indicates that the use of adjuvants did not enhance the final control of RR® corn when mixed to this herbicide, despite of the anticipatedin control process, as observed at 7 and 14 DAA.

Specifically to the herbicide clethodim, the addition of mineral oil increased the control when compared to other adjuvants and the herbicide alone, guaranteeing control level near to 100%. Similar values were achieved by treatments with quizalofop.

On the second replication of the experiment, the action of the herbicides was slower with levels of control lower than 27% at 7 DAA (Table 4). Factors like temperature, relative humidity e luminosity could have influenced the herbicide control on the second replication, in May. Low temperatures, for example, increases the amount of wax in leaves and decreases the metabolism of plants, resulting in lower absorption and translocation of the product (Cieslik *et al.*, 2013). Thus, this difference highlights the importance of experimental replication in different seasons.

Table 4: Control efficiency (%) of the herbicides clethodim and quizalofop mixed with adjuvants on volunteer RR® corn (2nd replication). Botucatu, SP, 2018

Treatment	Control (%) – 2nd replication					
	7 DAA		14 DAA		28 DAA	
	clethodim	quizalofop	clethodim	quizalofop	clethodim	quizalofop
Without adjuvants	19,0 aB	26,4 aA	48,7 bB	77,4 bA	83,9 cB	99,4 aA
Argenfrut®1	19,6 aB	25,8 aA	73,6 aB	89,9 aA	96,9 aB	100,0 aA
Natur'l oleo®2	19,0 aB	24,8 aA	57,0 bB	78,2 bA	91,8 bB	98,6 aA
Silwet L77®3	20,6 aB	25,0 aA	58,6 aB	83,7 abA	86,9 cB	100,0 aA
$F_{herb\ x\ adj}$	$9,65^{**}$		$1,69^{ns}$		$26,48^{**}$	
F_{herb}	$84,98^{**}$		$124,83^{**}$		$302,99^{**}$	
F_{adj}	$1,64^{ns}$		$15,20^{**}$		$27,45^{**}$	
CV (%)	9,71		9,11		1,85	

Means followed by the same uppercase letters (line) and lowercase (column) do not differ on Tukey's test ($p \leq 0,05$). ns: non significative; * significative ($p \leq 0,05$); ** significative ($p \leq 0,01$), by F test.; [1]mineral oil; [2]vegetal oil; [3] organosilicon. CV: coefficient of variation.

At all visual assessment of control (7, 14 and 28 DAA), the herbicide quizalofop demonstrated better control than clethodim, reinforcing the evidence of greater control efficiency of this herbicide on volunteer RR® corn, at V2-V3 stage growth.

The adjuvants did not show any differences of control compared to the herbicides alone. This outcome probably occurred because of the low levels of control observed in this evaluation (7 DAA). At 14 DAA, the herbicide clethodim showed higher level of control when mixed with the mineral oil. Similar effect was observed in the first replication. In treatments with quizalofop, the use of mineral oil provided higher control compared to the herbicide alone and with vegetable oil, however did not differ from the organosilicon surfactant (Table 4).

Increased herbicide activity promoted by adjuvants can occur due to droplets spreading factor, higher retention of active ingredient by plant surface (Baur & Aponte, 2014) and breakdown of cuticular waxes that can interact increasing the amount of herbicide absorbed, caused by the use of penetrating agents (Izadi-Darbandi *et al.*, 2019; Somervaille *et al.*, 2012). Thus, application, absorption, translocation and metabolism of herbicides are factors that affects how symptoms are expressed in plants (Carvalho *et al.*, 2019).

It is noteworthy that in the present study there was no effect of adjuvants on deposition. Thus, it is understood that the differences between treatments are not the result of the amount of active ingredient deposited on the target, but of the other processes that determine the activity of the herbicide mentioned above.

At 28 DAA, the addition of vegetable oil also increased control compared to the herbicide clethodim alone, however the level of control was lower than those provided by mineral oil. The treatments with quizalofop did not show increase in efficiency when mixed to the adjuvants. Similar to the first replication.

Among the adjuvants under study, the manufacturer of the herbicides clethodin and quizalofop recommends only mineral oil. In contrast, at the field the use of other adjuvants is common. There for, carry out research that demonstrates the effect of herbicides with different adjuvants is important.Considering the effects of adjuvants in both experimental replications it is possible to say that the addition of mineral oil enhance the effects of the herbicide clethodim, increasing fastness of action and final control efficiency. For the herbicide quizalofop, the vegetable oil adjuvant helped in the fastness of control, however, the final control did not presented advantages by adding adjuvants. The organosilicate adjuvant anticipated the control with the herbicide quizalofop in the first replication of the experiment, but the effect was not significant in the second.

CONCLUSION

The adjuvants ensured reduction of surface tension of both herbicides, clethodim and quizalofop, influenced by concentration, being the most efficient the organosilicon adjuvant Silwet L-77®.

The adjuvants in this study did not alter spray deposition of the herbicides clethodim and quizalofop in volunteer RR® corn plants.

The mineral oil adjuvant Argenfrut® increases the efficiency of the herbicide clethodim in the final control of volunteer RR® corn and anticipates the control with the herbicide quizalofop.

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