

Spray application in canola

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Canola is one of the world's most versatile and valuable crops, playing a vital role in the agricultural economy. However, like any crop, canola is vulnerable to pests and diseases that can significantly reduce yields if not properly managed.

Effective control starts with getting the basics of sprayer setup and calibration right. The relationship between factors such as water volume per hectare, droplet size, and forward speed is crucial, as each of these variables influences the others. Understanding spray application methodology is essential to maximise the effectiveness of every spray pass to ensure pest and disease control.

A key aspect of spray application that is often overlooked is the maintenance of spraying equipment. When spray equipment is not maintained unexpected breakdowns happen more often, which can be detrimental to the timing of critical sprays (for example 30% flowering stage fungicide spray application for *Sclerotinia* stem-end rot).

Height of the boom

When setting up a spray boom, attention must be given to the boom height above the target crop area and the nozzle fan angle. An industry standard recommendation is to run a spray boom between 35 and 50cm above the target crop canopy. A boom height of 50cm will ensure 100% overlapping between neighbouring nozzles from 80- to 110-degree nozzles.

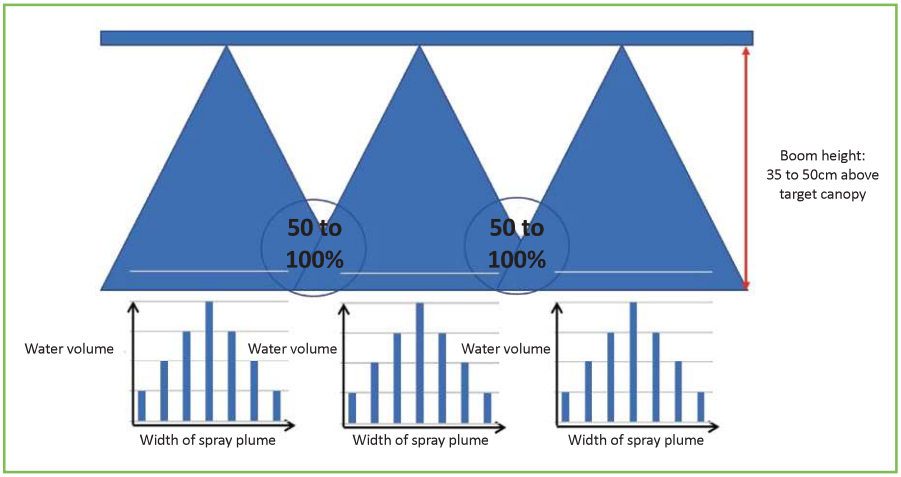
Overlapping is important as the volume and droplet size produced in the spray plume of a flat fan nozzle are not uniform from the middle to the side of the plume (*Figure 1*). Overlapping must be sufficient to ensure an even distribution of spray volume over the width of a spray boom. Boom height above the canopy thus needs to be increased throughout the growing season as canola canopies become higher and more complex, to stay within the 35 to 50cm above the top of the canopies.

Time and speed factors

Spraying speed is a determining factor for spraying logistics, effectiveness, and safety. The ideal is to use a spray speed that will allow the operator to do the spray application under the most ideal environmental conditions during the day/or night, achieve optimal deposition parameters, reduce drift, and do so as efficiently as the equipment and driving surface will allow.

We want to do the right application at the right time. An example of this is herbicide application that should be done at the weed's sensitive growth stage or a preventative fungicide application to susceptible plant material before a potential infection period. If the application is not done in the optimal time slot, poorer effectiveness of the application can be expected.

Figure 1: Water volume distribution across the width of the spray plume produced by normal flat fan nozzles, thus indicating the need for spray plume overlap.



It is important to choose the optimal spraying speed according to a farming unit's specific circumstances. As the spray boom moves through the air, the air movement caused by the wake of the moving sprayer affects the formation of the spray plume and the ability of the droplets to reach the target area. If the spraying speed increases, the wake of the sprayer can intercept droplets before they reach the target area. These intercepted droplets are prone to spray drift out of the target sprayed area.

Spray factor trials

Spray deposition trials were conducted by ProCrop in 2020/21 in collaboration with the Western Cape Department of Agriculture (WCDA) to investigate the effects of water volume, spraying speed and droplet size on spray deposition in winter wheat. Data generated indicated that spraying speed has a direct decreasing effect on spray deposition as indicated in *Figure 2*. This should be considered when spraying later in the canola growing season (for example the 30% flowering spray application for *Sclerotinia* stem rot management).

Increasing spraying speed can lead to lower canopy penetration in this critical spray period. Thus, when selecting a forward speed for these applications, data suggests a more conservative spraying speed will still have you finish the spray application at the right time while ensuring optimal spray deposition. ProCrop and the WCDA is currently busy with a similar spray deposition project in canola to investigate how spraying speed and water volume affect spray deposition in canola plants at the four- to six-leaf growth stage and the 30% flowering stage.

Optimal water volumes

The selection of water volume per hectare plays a critical role in ensuring optimal spray deposition. It is important to consult plant protection product labels for recommendations regarding specific water volume rates per hectare. Spray deposition trials were conducted in 2023 by ProCrop and the WCDA on the influence of water volume rates on deposition quantity at the four- to six-leaf stage and 30% flowering stage of canola plants.

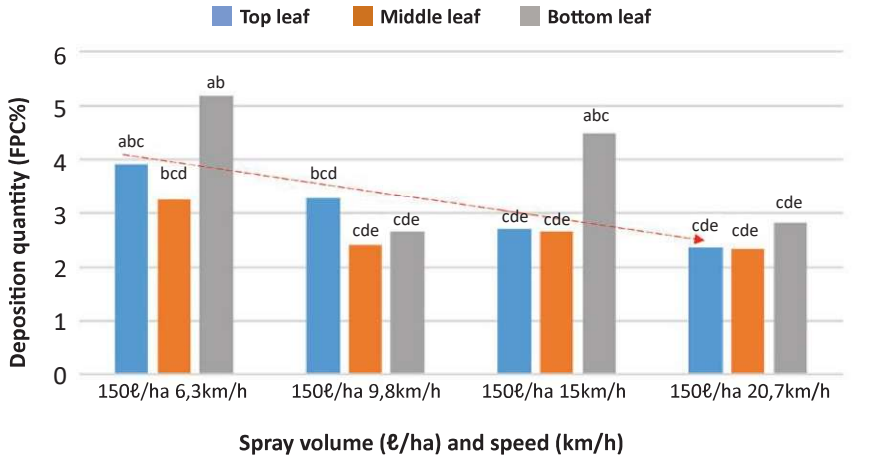
Data suggests an advantage in using lower water volume ranges within a given water volume recommended by fungicide labels as illustrated by *Figure 3*. For example, Aviator® Xpro from Bayer recommends that spray applications be made in at least 250 to 350ℓ/ha when doing ground-based boom spray applications. From these trails using the 250ℓ/ha water volume rate will be the preferred selection within this given volume range.

The effect of higher spray deposition at a lower water volume rate is due to a higher active ingredient concentration per droplet when using lower water volume rates compared to a higher water volume rate. This effect results in a higher deposition quantity per droplet impact on a target surface. This effect has been observed across a wide range of crops sprayed at low-volume concentrate spays. However, this advantage only holds when the number of droplets released towards the target is sufficient.

This lower limit for droplets or water volume rate needs to be determined for each crop type and growth phase. Recent studies in winter wheat indicated a rapid decline in deposition quantity when water volume rates below 100ℓ/ha were used compared to 100 and 150ℓ/ha, while using a constant product dose per hectare between water volume rates (unpublished data, ProCrop).

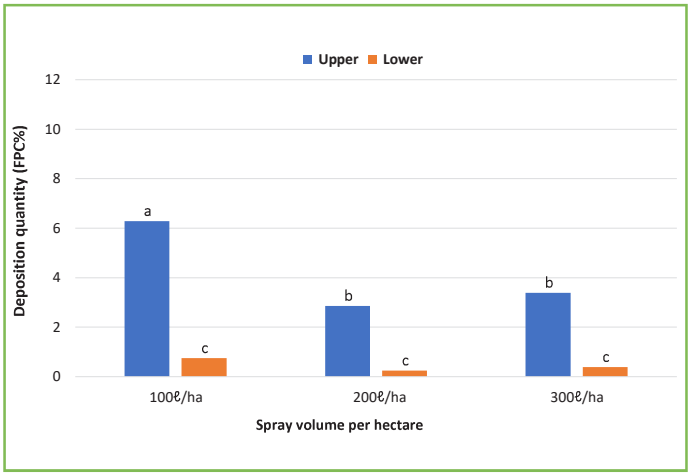
Trails to determine the lower limit for water volume rate on canola plants at the four- to six-leaf stage and 30% flowering stage were conducted in 2024 by ProCrop

Figure 2: Spray deposition on wheat leaves as a result of different forward speeds used to spray the applications.



Bars with the same letters do not differ significantly according to Tukey's HSD test.

Figure 3: Spray deposition quantity resulting on the upper and lower leaf surface of canola plants at the 30% flowering growth stage when sprayed at 100ℓ/ha, 200ℓ/ha and 300ℓ/ha water volume rates. The active ingredient dosage per hectare was constant between the three spray volumes tested.



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and the WCDA in collaboration with the Plant Pathology Department of Stellenbosch University. Data will be published in due course.

Strategy leads to success

When selecting nozzles for a given water volume rate for a spray application at a given sprayer speed or speed range, the droplet size produced by the nozzle needs to be considered. Spray deposition trials done in wheat, onions and potatoes indicated that using medium (volume median diameter [VMD] range 236 to 340 micron) to coarse (VMD range 341 to 403 micron) droplets strikes a balance between coverage area and drift reduction. Medium to coarse droplets provide sufficient coverage while reducing the risk of drift, especially when using lower water volumes.

Be mindful of self-calibrating systems when selecting a nozzle with a given droplet size at a given pressure. As the sprayer speed increases, the self-calibration system will increase the liquid pressure through the nozzles to ensure constant water volume rates per hectare. However, with an increase in pressure the droplet spectrum of a nozzle changes towards finer droplets. Thus, when selecting a nozzle make sure the droplet spectrum over the pressure range to be used is within the desired droplet range. Consult the nozzle catalogue of the brand of nozzles that you are interested in buying to help aid this decision.

Consider your spraying strategy before setting out to do a spray application. The principles in this article are a reminder of some of the most important influencing factors that can help ensure that the right plant protection product selected reaches the target successfully. Consider these before investing in new technologies to aid the spray application process. Further optimisation for spray application in canola production is an ongoing process towards a well-oiled process.

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