Žan Mongus[1]

Review paper

UAV spraying in wheat, maize and soybean: review 2023-2025

Abstract

This review synthesizes 2023 to 2025 field evidence on unmanned aerial vehicle (UAV) pesticide application in wheat (Triticum spp.), maize (Zea mays) and soybean (Glycine max) in the Slovenia/Croatia context. Across studies, near-canopy release heights (0.5-2.0 m above crop) and moderate forward speeds (1-2 m s^{-1}) consistently improved on-target deposition and transverse uniformity relative to higher passes. Nozzle characteristics governed the coverage -drift balance: flat-fan tips increased water-sensitive-paper coverage, whereas air-induction tips reduced fine-fraction drift at some cost to coverage; centrifugal atomizer performance depended on rotational speed and flow. In maize whorl targets, factorial trials indicated effective water volumes ≥37.5 to 45 L ha^{-1} with appropriate nozzle/orifice choices, while raising height widened swath but reduced on-leaf deposition. Large sample size drift analyses confirmed release height and wind speed as dominant drivers of off-target movement. Field reports in wheat and soybean showed UAV efficacy comparable to ground references when flight and atomization parameters were tuned, with potential gains in field capacity and operator protection. Key reporting gaps remain (pressure for hydraulic systems, mass-based deposition, and complete meteorology), limiting cross-study dose transfer. We recommend a minimum reporting set (height, speed, L ha^{-1}, nozzle identity/orifice, droplet metric, swath/overlap, drift transects, weather), and outline uncertainties to resolve in regional trials. Overall, UAV spraying is feasible for the three crops when operated near the canopy with spectrum and volume matched to the target and conditions.

Keywords: *UAV; pesticide application; nozzle; deposition; drift*

Introduction

In the 21st century, agriculture faces pressure from climate change, the depletion of land and water resources, and continued population growth. These factors together strain existing farming systems and food security. Assessments show that climate change is already impacting agricultural productivity and elevating food-security risks; land, soil and freshwater resources are under increasing stress; and demographic growth adds further pressure on natural resources. These converging pressures make it essential to combine agronomic and technological innovation including digital and precision agriculture to raise productivity while

1 Žan Mongus, Msc, Kmetijski inštitut Slovenije, Hacquetova ulica 17, 1000 Ljubljana, Slovenija
Corresponding author: *zan.mongus@kis.si*

protecting the environment (Anderson, et al.., 2020; The State of the World's Land and Water…(FAO), 2022; Climate Change 2022…IPCC, 2022; Maja and Ayano, 2021; Anitei et al., 2020).

The advancement and adoption of precision farming technologies have positioned drones as a viable and environmentally sustainable option for plant protection, recently extending their role beyond remote sensing. Uncrewed aerial spraying requires aligning flight variables (release height, forward speed, overlap) with atomization (nozzle family, pressure, droplet spectrum), because these factors jointly determine on-target deposition, drift, and penetration into crop canopies. Recent reviews emphasize operation-centric reporting that links platform, atomizer and environment to field performance (García-Munguía et al., 2024). Recent field tests also report reduced operator exposure and off-target drift under near-canopy heights with appropriate droplet spectra (Gao et al., 2025).

Field trials comparing UAV with tractor-based spraying in wheat reported energy use of 146.84 MJ ha-1 for UAV versus 365.26 MJ ha-1 for conventional sprayers, with global warming potential reduced from 41.28 to 14.48 kg CO2 ha-1. In conventional spraying most impact came from fuel combustion, whereas for UAVs it was linked to battery manufacturing and charging. These studies indicate potential gains in energy efficiency and a lower environmental footprint, while noting battery constraints and the need for skilled operators (Safaeinejad, et al., 2025).

Within the EU, aerial application of pesticides is prohibited by default; derogations are possible only in special cases after a risk assessment and explicit approval (Directive 2009/128/EC, Art. 9). Any drone operation must also comply with the UAS operating framework (Commission Implementing Regulation (EU) 2019/947, 2019). Slovenia transposes prohibition on aerial spraying (exceptions via competent-authority approval) (Zakon o fitofarmacevtskih sredstvih, 2012) but is making clarifications on allowing public research institutions on conducting field experiments and research on considering regulations and obtaining permits (Zakon o fitofarmacevtskih sredstvih (ZFfS-1), 2012). Croatia also bans aerial spraying but defines an approval pathway that includes a risk assessment and mandatory public disclosure of planned area, crop, timing, and product. (Zakon o održivoj uporabi pesticida, 2022).

The review focuses on recent findings in UAV spraying plant protection for wheat (Triticum spp.), maize (Zea mays) and soybean (Glycine max), since they have the most area coverage and production reported in Slovenia and Croatia. Slovenia 2024 reports indicate 27,976 ha wheat, 68,704 ha grain maize, and 4,162 ha soybean production (Bedrač et al, 2024) and Croatia's first 2024 reports show 138 kha wheat, 297 kha maize, and 102 kha soybean (Površina i proizvodnja žitarica…, 2025).

Since operational performance is crop specific and influenced by flight variables (height above canopy, forward speed, swath width/overlap) and spray generation parameters (nozzle type, pressure, droplet spectrum, flow rate), while canopy structure and microclimate further affect deposition, penetration, uniformity, and drift, it is essential to tailor such operations to specific crops and to plan them based on the latest research findings. Contemporary reviews of weed-management strategies likewise converge on precision spraying supported by sensing, adjuvants and route automation, with nozzle choice balancing coverage against drift (Gatkal et al., 2025; Yan et al., 2025).

Materials and methods

This review was prepared following a structured literature search and screening process designed to ensure methodological transparency and reproducibility. The search was conducted in August 2025 and targeted three crops of primary agronomic importance in Slovenia and Croatia: Corn (Zea mays L)., wheat (Triticum spp.) and Soybean (Glycine max). The choice of these crops was based on their consistently high share of cultivated land and production value in both countries, making them relevant for assessing the technical and regulatory feasibility of UAV-based pesticide spraying in the regional context.

Three primary databases (Web of Science, PubMed, and Google Scholar) were filtered using crop-specific search strings that combined UAV related terms with spraying related and crop related keywords. Search terms were adjusted to the syntax of each database but followed the general format:

(“UAV” OR “drone” OR “unmanned aerial vehicle”) AND (“2023” OR “2024” OR “2025”) AND (“spraying”) AND (“maize” OR “corn”)

with equivalent modifications for wheat and soybean. The publication year filter was set to 2023 to 2025 to capture the most recent field trials, with all queries performed separately for each crop type to ensure balanced coverage.

Research criteria required that studies be peer reviewed scientific articles in English, freely accessible in full text, and containing original experimental data or review analyses relevant to UAV spraying. Papers were considered eligible if they reported one or more of the following: UAV hardware specifications (model, payload, rotor configuration), spray system configuration (nozzle type and size, working pressure), operational parameters (altitude, forward speed, swath width, overlap, application rate), droplet size metrics (e.g., VMD - Volume Median Diameter), deposition, penetration, and drift outcomes under defined meteorological conditions. We report droplet size as VMD (also noted as DV0.5 in some papers - diameter volume median 50% of droplet size), and we keep all units and statistics as reported by the original authors. Studies were excluded if they: (i) investigated crops outside maize, wheat, or soybean; (ii) were published in languages other than English; (iii) lacked peer review; (iv) consisted solely of pilot project reports, conference abstracts, or opinion pieces without reproducible experimental methods; or (v) were paywalled with no open access option; or (vi) were focused on UAV imaging using multispectral sensors.

All retrieved records were imported into a reference database, where duplicates across search platforms were identified and removed. The initial search yielded approximately 100 publications related to UAV spraying. Following title, abstract, and full text screening, and after applying predefined inclusion and exclusion criteria, 27 articles were identified as relevant. These publications specifically addressed UAV spraying in the major field crops of maize, wheat, and soybean. More articles were found on the topics of specific technical characteristics like drift, nozzles and environmental factors.

We extracted data using a predefined template capturing bibliographic details, trial location and year, crop and growth stage, UAV platform and spray setup, operating settings (flight altitude, forward speed, nozzle type, application rate, swath width when reported), meteorological conditions, and performance metrics. Where available, we recorded droplet size statistics such as DV0.5 (VMD, µm); otherwise, we used water sensitive paper outputs (droplet density and coverage), canopy penetration indicators, and downwind drift measurements. For every paper we noted who ran the trial, where and when it took place, the crop and growth stage, the drone and sprayer setup, the key operating settings (flight height, forward speed, nozzle type, application rate, and swath width when reported), the weather during spraying, and how performance was measured (for example, coverage on water sensitive paper, canopy penetration, and any downwind drift readings). We double checked all entries for consistency before analysis.

Results and Discussion

Operating height, speed and volume

Evidence from wheat, maize and soybean converges on low flight heights and moderate speeds as the most reliable starting point. A controlled wheat study that emulated ground boom geometry on a moving rig showed that 0.5 to 1.0 m above crop level, at 0.57 to 1.0 m s^{-1}, produced higher deposited volume and more even transverse distribution than higher passes, with a pump pressure of 0.2 MPa held constant. Release heights under a meter tightened the spray footprint and improved transverse uniformity over the wheat canopy; staying near the crop surface is a robust principle for cereals (Berner et al., 2024).

Across common field crops, varying flight height and nozzle family systematically shifts spray characteristics: lower release heights improve on target capture, while air induction tips reduce drift at some cost to coverage relative to flat fans (Ranabhat and Price, 2025). Where centrifugal atomizers are used, rotational speed and flow set DV0.5 and span, so atomizer settings must be coupled to near canopy operation to maintain coverage while respecting drift constraints (He et al., 2024).

For fall armyworm (Spodoptera frugiperda) whorl targeting in maize, factorial field trials indicate that increasing nozzle orifice and dose per hectare volume within typical UAV ranges improves whorl deposition, with near canopy release heights giving the most consistent results (Liu et al., 2025). For non-whorl foliar targets, the height-swath compromise holds raising height widens swath but dilutes on-leaf deposition (Cunha and da Silva, 2023). A separate maize deposition study complements this by showing that at 1.5 m height the tracer uptake on leaves matched a knapsack reference, while lifting to 3.0 m reduced deposition; effective swath expanded from 5.7 m (1.5 m height) to 7.6 m (3.0 m), highlighting a coverage swath trade off (Cunha and da Silva, 2023)

For soybean used primarily as a weed-control case study, the most informative trial reported the highest deposition at 2 m flight height and 2 m s^{-1} forward speed, with off-target deposition "negligible" under the study's single-rotor configuration (Hiremath et al., 2024). In soybean at 2 m AGL (above ground level), nozzle family at low volume (10 L ha-1) controlled the coverage -drift trade-off: hollow-cone and AI tips maximized mass-based deposition in the upper/lower canopy, while WSP (water sensitive paper) coverage stayed <1% versus 5% for a 100 L ha-1 ground reference (Lopes L.L. et al., 2023).

A maize-focused systematic review classifies crop-protection UAV work into "watching" (data acquisition/monitoring with RGB, multispectral/thermal and LiDAR plus machine learning) and "doing" (spraying). The authors note that no integrated real-time pipeline currently links UAV sensing, data processing, storage and communications to field actuation, and they summarize rotor-downwash and platform-design effects that influence droplet transport and canopy deposition. In this paper we therefore use Yan et al. (2025) to frame the systems context; the quantitative spray settings synthesized here come from field trials in maize, wheat and soybean.

Nozzles, pressure and droplet spectrum

At the low water volumes typical for UAVs, droplet spectrum governs the coverage -drift balance: in hydraulic nozzles (pressure-fed tips), flat-fan tips increase WSP coverage, whereas air-induction tips coarsen the spectrum and reduce fine-fraction drift (Yu et al., 2023). Multi-crop tests corroborate a height × nozzle interaction: flying near the canopy maximizes on-target deposition for a given spectrum (Ranabhat and Price, 2025). In centrifugal atomizers (rotary disc/cup), rotational speed and feed rate (flow) set DV0.5 and span—higher speed tends to reduce VMD at a given flow, while higher flow tends to increase VMD at a given speed; field application heights with these systems typically fall within 1 -3 m AGL (He et al., 2024). Here we distinguish hydraulic nozzles (flat-fan, air-induction; pressure-through-orifice) from centrifugal atomizers (rotary disc/cup; shear/film breakup on a spinning element). In soybean at 1 m canopy, a randomized field trial compared three UAV nozzle families at 10 L ha-1 flat-fan XR 11001, air-induction flat-fan AirMix 11001, and hollow-cone COAP 9001 against a ground reference (XR 110015, 100 L ha-1) at 2.0 m AGL and 20 km h-1. Average tracer deposition (upper/lower canopy) was 3.693/0.747 µg cm-2 (COAP 9001), 3.180/0.788 µg cm-2 (AirMix 11001), 1.728/0.394 µg cm-2 (XR 11001), and 2.061/0.264 µg cm-2 for the ground XR 110015. WSP coverage (upper) was 0.22 to 0.48% for UAV vs 5.00% for ground; the <100 µm fraction was 18.28% (COAP), 3.04% (AirMix), 8.58% (XR 11001), and 1.77% (ground), illustrating the coverage -drift trade-off and downwash-enabled penetration with AI tips. Practically, pair near-canopy flights with air-induction when drift constraints dominate and prefer hollow-cone where on-leaf deposition is the priority (Lopes L.L. et al.2023).

Deposition, penetration and drift

Penetration into the target layer depends on canopy porosity and rotor-induced recirculation; excessive height weakens the downwash that transports droplets into the whorl/upper leaves. (Liu et al., 2024). Canopy-flow observations in wheat showed recirculating cells above the canopy that, at lower release heights, promote impaction on upper leaves are consistent with field evidence favouring ≤1-2 m (Qin et al., 2023).

Under 1 m AGL and 3 m s-1, the UAV with a rotary (centrifugal) atomizer and the UAV with a hydraulic flat-fan nozzle produced VMDs of 219 -258 µm and 213 -267 µm, respectively, with droplet densities 42 -57 cm-2 measured at 1 -5 m lateral positions; densities did not differ across the 5 m swath, indicating stable coverage within the intended band (Shanmugam et al., 2024).

Drift behaviour has been quantified at scale in a dataset of 114 UASS drift trials: variance-based sensitivity analysis and ML ranking identify release height and wind speed as dominant contributors, with coarser spectra mitigating drift but potentially lowering on-target coverage (Goulet-Fortin et al., 2024). Field deposition in maize likewise shows the trade-off: raising height from 1.5 m to 3.0 m widened the swath (5.7→7.6 m) but reduced on-leaf deposition (Cunha and da Silva, 2023), which aligns with the drivers identified in the large dataset (Goulet-Fortin et al., 2024)

A hovering/CFD (computational fluid dynamics) study in soybean further clarifies the role of rotor downwash: increasing rotor speed (300→500 rad s^{-1} “Radian per second”) reshaped the wash and altered droplet settling within a porous canopy model, reinforcing why near-canopy operations often improve delivery into the upper/mid layers and why droplet size must balance transport vs. bounce/evaporation (Liu et al., 2024). Complementary helicopter-in-corn simulations show analogous canopy flow structures, supporting the generality of rotor canopy interactions across platforms (Tang et al., 2024).

Human-exposure work complements drift metrics with bystander dermal loading measured under several crop-treatment scenarios. A study done also on soybean spraying shows that low release heights and moderate winds keep dermal exposure low versus some ground references, reinforcing our wind/height guidance and buffer use near sensitive areas (Gao et al., 2025).

Actives, adjuvants, biologicals

In wheat fusarium crown rot (Fusarium pseudograminearum), UAV application delivered field efficacy comparable to ground-boom benchmarks when operated near the canopy with appropriate overlap. (Köycü et al., 2024) For wheat Sunn pest, a head-to-head against a very-low-volume knapsack demonstrated >95 % effectiveness for both systems, with the UAV using 14.6 L ha^{-1} and reaching 3.75 ha h^{-1} field capacity vs 0.5 ha h^{-1} for the knapsack; UAV use also reduced operator exposure and apparent drift (Sheikhigarjan et al., 2024).

Adjuvants can be decisive at the low water volumes typical of UAV work. A wheat leaf contact-angle study showed that oil-based and silicone-based tank-mix adjuvants markedly reduced contact angle on the adaxial surface, indicating better spreading/retention potential; the authors also cite UAV field work in wheat where adjuvants improved control persistence (Meng et al., 2023). In parallel, the nozzle comparison on drones quantifies how AI nozzles (coarse VMD) curb drift whereas flat-fans increase coverage information that should guide adjuvant selection (spreader/sticker vs. drift-reduction strategies) depending on target position in the canopy and wind exposure (Yu et al., 2023).

Initial leaf residues of chlorantraniliprole were highest for high-volume (60 µg g-1) and next for UAV atomizer (47 µg g-1), with UAV flat-fan lower (40 µg g-1); soil residues were below detection across systems, while water samples near sprayed plots registered BDL for high-volume/CDA and 0.30 -2.81 µg L-1 for UAV nozzles shortly after application (Shanmugam et al., 2024).

Applying dry dust using drones of Metarhizium rileyi conidia in maize and soybean reduced fall armyworm (Spodoptera frugiperda) and soybean looper (Chrysodeixis includens), showing that particulate biologicals can be delivered effectively by multirotors when delivery is aligned with target location (Lopes R.B. et al., 2024). Additionally, a national monitoring study around UAV-sprayed soybean and rice field documented pesticide residues on surrounding crops and performed risk analysis; while not a field-trial on wheat or soybean per se, it underscores the regulatory relevance of drift mitigation for all UAV spray operations in mixed landscapes (Kim et al., 2023).

Recent syntheses on weed management emphasize precision application, route automation, low-volume sprays with adjuvants, and nozzle selection tuned to the coverage -drift trade-off (Gatkal et al., 2025), consistent with crop-protection UAV reviews highlighting AI-assisted path planning and automation (Yan et al., 2025). Consistent with this, an irrigated barnyard millet field trial optimizing herbicide dose × spray fluid for UAV vs. manual treatments (RBD - randomized block design; 3 reps; 20 × 5 m) showed that pretilachlor 500 g·ha^{-1} at 40 L·ha^{-1} UAV dose per hectare achieved 91.9 % weed-control at 15 days after treatment, with the highest output energy (79,160 MJ·ha^{-1}) and energy-use efficiency (15.1 - energy use efficiency = output energy / total input), indicating that low-volume herbicide delivery by multirotors is feasible when dose and water volume are co-optimized; because crop structure differs from wheat/maize/soybean, we treat this as indicative rather than directly transferable (Sangeetha Jebalin et al, 2024).

Biological efficacy

A two-location maize field trial comparing UAV centrifugal atomizer, UAV with a hydraulic flat-fan nozzle, high-volume knapsack (backpack sprayer with hydraulic nozzles operating at high dose per hectar volumes—typically hundreds of L ha-1; hand/CO_2/air-pressurized), and a controlled droplet application knapsack (battery-driven spinning-disc ULV/LV backpack sprayer that sets droplet size by disc speed; low dose per hectar volumes and a narrow droplet spectrum) across two FAW windows found that the UAV atomizer achieved FAW damage reduction comparable to the high-volume sprayer (e.g., 41 -52% vs 51 -61% pooled reductions), while UAV flat-fan was intermediate. The authors attribute the performance gap to whorl targeting and droplet retention patterns under rotor downwash (Shanmugam et al., 2024).

In wheat, a randomized block trial (8 treatments; 3 replicates) compared pre-emergence (PE) knapsack metribuzin with post-emergence (POE) UAV metribuzin and their combined use. Sprayer calibration showed a dose per hectare volume contrast of 25 L ha-1 for UAV versus 516 to 682 L ha-1 for knapsack. The UAV used IDK120 nozzles at 0.3 MPa and was flown at 3 m AGL under light winds as a drift-management precaution. The combined PE-knapsack + POE-UAV treatment delivered the highest herbicide-managed yield among chemical programs (4,256.6 kg ha-1, 284.97 grains plant-1), only 2.8% below the weed-free control, whereas the weedy check lost 38% yield; a reduced-dose POE UAV program (0.34 kg ha-1 metribuzin) still maintained competitive yields (3,511 kg ha-1) alongside hand weeding. These data indicate that low-volume POE by UAV can match or exceed high-volume knapsack outcomes when combined with PE control, while illustrating the dose per hectar volume and height versus drift trade-offs relevant to UAV herbicide work (Pranaswi et al., 2024).

In soybean, field comparisons matched ground-boom outcomes when operated near 2 m AGL at 2 m s^{-1}, consistent with nozzle-spectrum trade-offs reported for drones. (Hiremath et al., 2024; Yu et al., 2023). Low-volume UAV spraying (10 L ha-1) matched or exceeded a 100 L ha-1 ground reference for mass-based deposition in both canopy layers when nozzle family was optimized (COAP 9001/AI), while WSP coverage remained <1%, supporting mass-based deposition as the comparator at low volumes (Lopes L.L. et al., 2023).

In maize, raising release height widens the swath but lowers on-target leaf deposition (e.g., 5.7 m at 1.5 m AGL vs. 7.6 m at 3.0 m AGL), underscoring the height versus swath trade-off. However, droplet density does not always translate into sufficient coverage, so caution and testing are needed when applying products that require high target coverage (Cunha and da Silva, 2023). For whorl-targeted control, factorial trials report effective water volumes at ≥37.5 -45 L ha-1, with nozzle/orifice choices driving droplet density in the whorl; UAV settings achieved FAW control comparable to knapsack references while reducing water use by 90% (Liu et al., 2025).

Operational limitations and what's still missing

Three consistent reporting gaps limit cross-study synthesis. First, pressure (MPa) is seldom stated for UAV hydraulic systems, hindering reproducibility even when nozzle codes are provided; second, mass-based deposition (µL cm^{-2}) is rare compared with WSP coverage/density, which complicates dose transfer across crops and stages; third, meteorology beyond wind speed (temperature, RH, turbulence) is under-reported, even though large-scale drift work shows environment is as important as the spray system. Standard practice should therefore include height, speed, L ha^{-1}, nozzle ID and orifice, droplet metric (VMD (µmor at least WSP density, swath, drift transects under ISO-like layouts, and basic weather during application.

Energy -environment comparisons in wheat indicate that near-canopy UAV spraying can reduce per-hectare energy use and GWP (Global Warming Potential) relative to tractor systems, while shifting impacts from fuel combustion to battery life cycle; net benefits therefore depend on charging mix and field logistics (Safaeinejad, et al., 2025).

Conclusion

UAV spraying in wheat, maize and soybean is operationally feasible when operated near the canopy (0.5-2 m AGL), at forward speeds of 1 to 2 m s-1, with droplet spectrum and application volume tuned to the target. Field trials show comparable efficacy to ground references under optimized settings, while large number analyses highlight height and wind as the main drift drivers. Remaining gaps like pressure reporting, mass-based deposition, and complete meteorology, limit dose transfer across crops and stages. Regional trials in Slovenia and Croatia should adopt a minimum reporting set (height, speed, L ha^{-1}, nozzle ID/orifice, droplet metric, swath/overlap, drift transects, weather) to establish reproducible parameter outcome relationships and support risk-managed derogations under the aerial-application framework.

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Pregledni rad

Prskanje pšenice, kukuruza i soje bespilotnim letjelicama: pregled 2023.-2025.

Sažetak

Ovaj pregled sintetizira terenska mjerenja od 2023. do 2025. o primjeni pesticida bespilotnim letjelicama (UAV) na pšenici (Triticum spp.), kukuruzu (Zea mays) i soji (Glycine max) u kontekstu Slovenije/Hrvatske. U svim studijama, visine tretiranja blizu usjeva (0,5-2,0 m iznad usjeva) i izmjerene brzine kretanja (1-2 m s^{-1}) dosljedno su poboljšavale nanošenja škropiva na biljke i poprečnu ujednačenost u odnosu na prolaze na većoj visini. Svojstva i radni parametri mlaznica koje se koriste na dronovima određuju kvalitetu nanošenja prskalice i zanošenja; mlaznice sa lepezastim mlazom povećavaju pokrivenost vodo osjetljivih papirića, dok injektorske mlaznice smanjuju zanošenje finih frakcija kapljica na ukupnu pokrivenost; učinak centrifugalne mlaznice ovisan je od brzine vrtnje i protoka. Na površinu stabla i lišća kukuruza, faktorijalna ispitivanja pokazala su učinkovite količine vode ≥37,5 do 45 L ha^{-1} s odgovarajućim izborom mlaznica/otvora, dok je povećanje visine povećanje radnu širinu prskanja, ali smanjilo depoziciju škropiva na lišće. Analize drifta većina uzoraka potvrdile su visinu ispuštanja i brzinu vjetra kao dominantne pokretače zanošenja škropiva izvan cilja. Terenska izvješća o pšenici i soji pokazala su učinkovitost bespilotnih letjelica usporedivu s referentnim vrijednostima sa konvencionalnim prskanjem kada su parametri leta i atomizacije bili dobro podešeni, s potencijalnim dobicima u prinosu polja i zaštiti operatera. Ključni nedostaci u aplikaciji sa dronovima i dalje postoje (tlak za hidraulične sustave, zanošenje škropiva na temelju mase i vremenskih utjecaja), što ograničava usporedbu različitih studija prskanja sa dronom. Preporučuje se minimalni skup podataka za izvješćivanje (visina, brzina, norma škropiva L ha^{-1}, karakteristike mlaznice, prosječne veličine kapljica, radna širina/preklapanje, zanošenje škropiva, vremenski uvjeti) i utjecaj specifičnih uvjeta kod prskanja sa dronovima. Sveukupno, prskanje bespilotnim letjelicama izvedivo je za tri usjeva kada se provodi u blizini usjeva sa spektrom i volumenom škropiva usklađenim sa biljkama koje se prska, odabirom sredstava za zaštitu bilja, radnim i vremenskim uvjetima.

Ključne riječi: *bespilotna letjelica (UAV); primjena pesticida; mlaznice; nanošenje škropiva; zanošenje*