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Using Drones to Apply Plant Protection Products: potential benefits and regulatory requirements

Work to understand potential exposure routes and risks to operators

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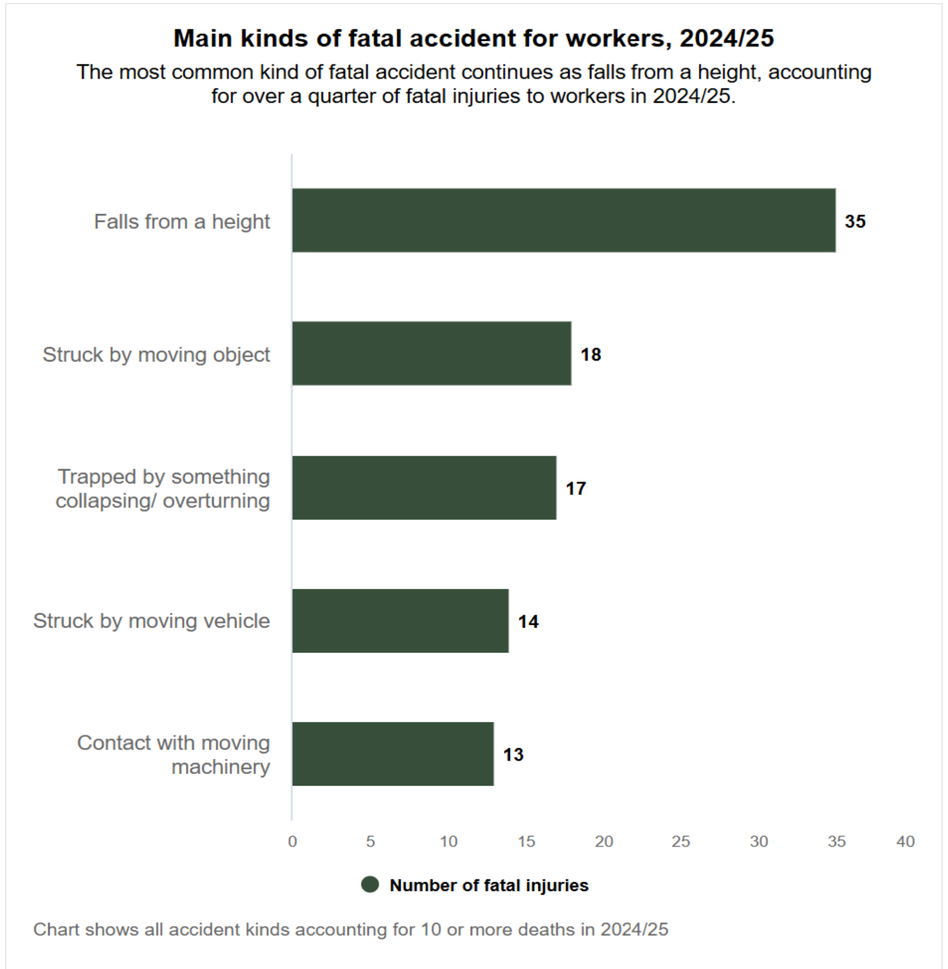
Why drones?

- Increased interest in using drones to apply pesticides
- Improved reliability and a more viable, cost-effective option
- Seen as being a more environmentally friendly option in certain use cases – reduced carbon emissions, reduced soil compaction etc.
- Major improvements in the technologies surrounding drone use:
  - Accuracy of geo-positioning technology (GPS, RTK and associated software / computer power)
  - Ability to capture site and pesticide application data
  - Applicator technology improvements – lances and precision of pesticide delivery to target

Use case scenarios of interest

- Agriculture and horticulture
  - ➢ Potential for increased efficiency
  - ➢ Access to land – direct flying, application in unfavourable conditions for terrestrial application of pesticides
  - ➢ Reduced carbon footprint
- Amenity / industrial areas
  - ➢ Access
  - ➢ **Reduced need for additional risk mitigation measures for workers**

Wider health and safety issues: working from height



Non-fatal injuries

- Around 8% of non-fatal injuries at work are caused by falls from height.
- 688,000 working days lost in GB
- Est. ~£850M per year
- Under-reporting
- Long term impact of falls on individuals

Data supplied by HSE

Drone use - working from height

PLAY VIDEO CLIP: TONY WILSON – Drone Demo UAPS

PLEASE PLAY 1 MINUTE ONLY

Drone use – agriculture and horticulture

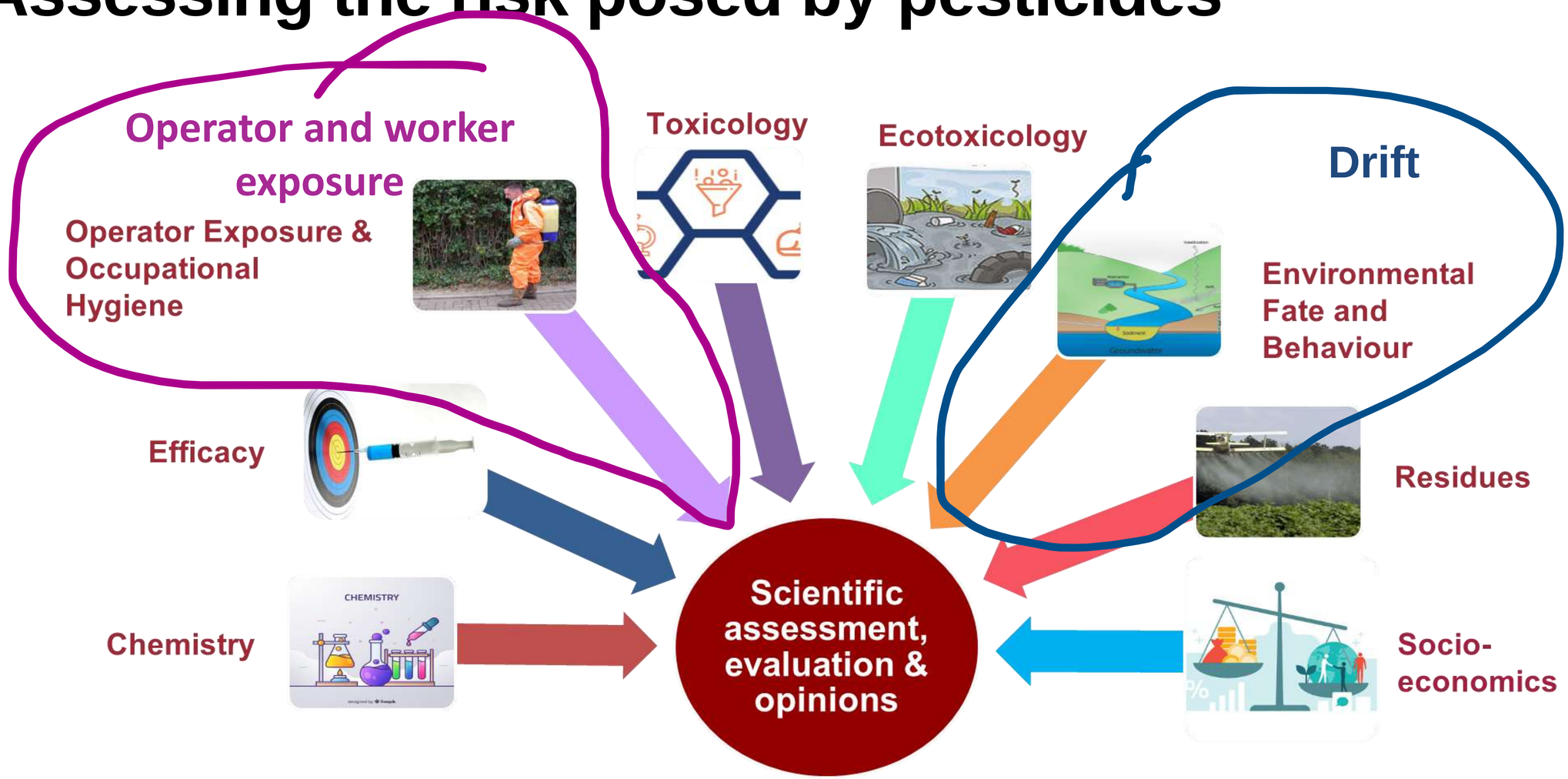
Current regulatory position: paperwork required

- Permit to fly a drone (CAA).
- Permit/authorisation to apply pesticide (HSE) – limited area with precautionary restrictions; designed to enable the applicant to generate data to support a commercial authorisation.
- Permit for aerial application of pesticide – for each scheduled spraying job.

Current regulatory position: next steps

- Data generation using extrapolated trials permits – authorised products only
- Aerial spraying permit procedures under review (Sustainable Use Regulations 2012)
- Certification of drone operators to be phased in – proposal under review
- Evaluation of data
- Moving towards commercial authorisation

Assessing the risk posed by pesticides



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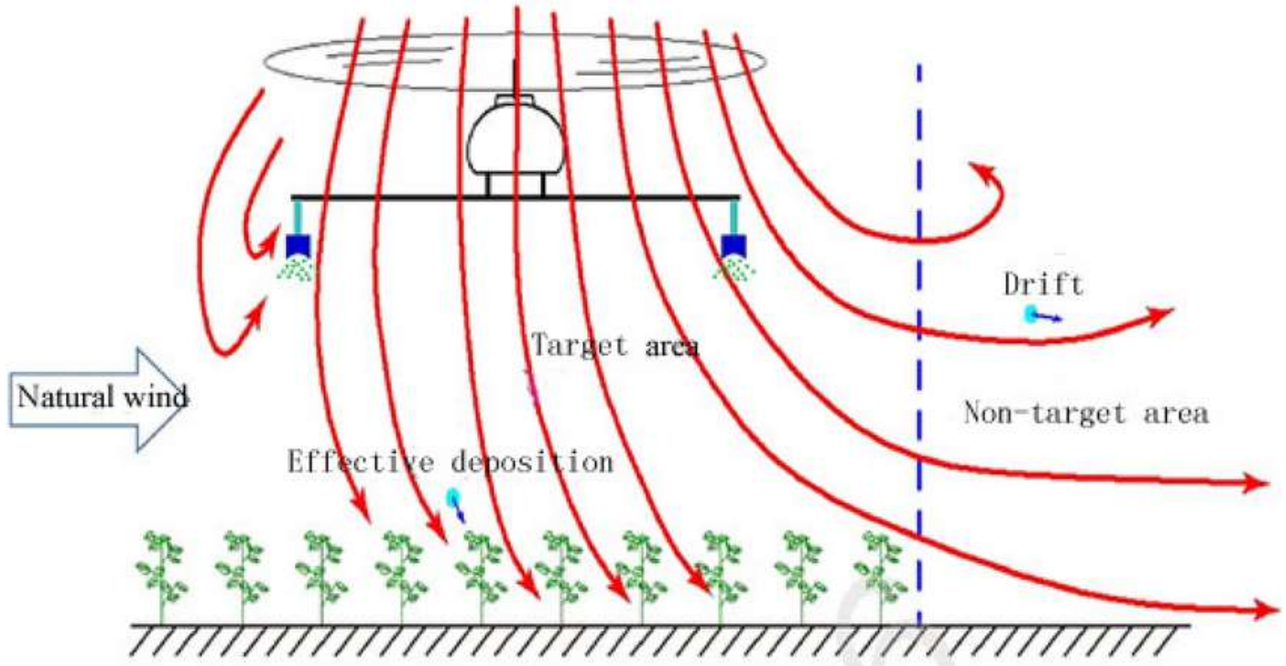
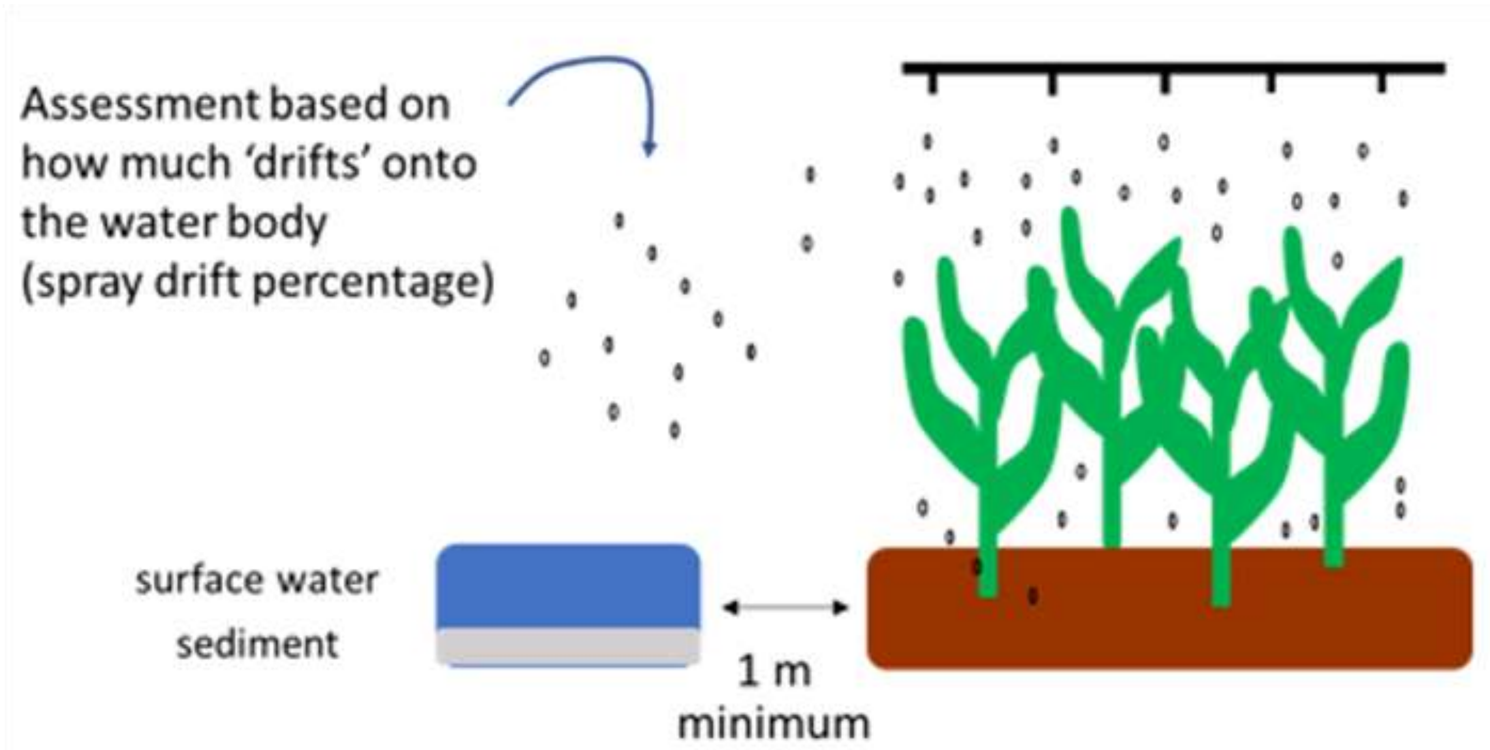
DETERMINING DRIFT

Drift


Drift
Target area
Natural wind
Non-target area
Effective deposition

Why is off-site drift important?



Comparing drift from drones with other applicators

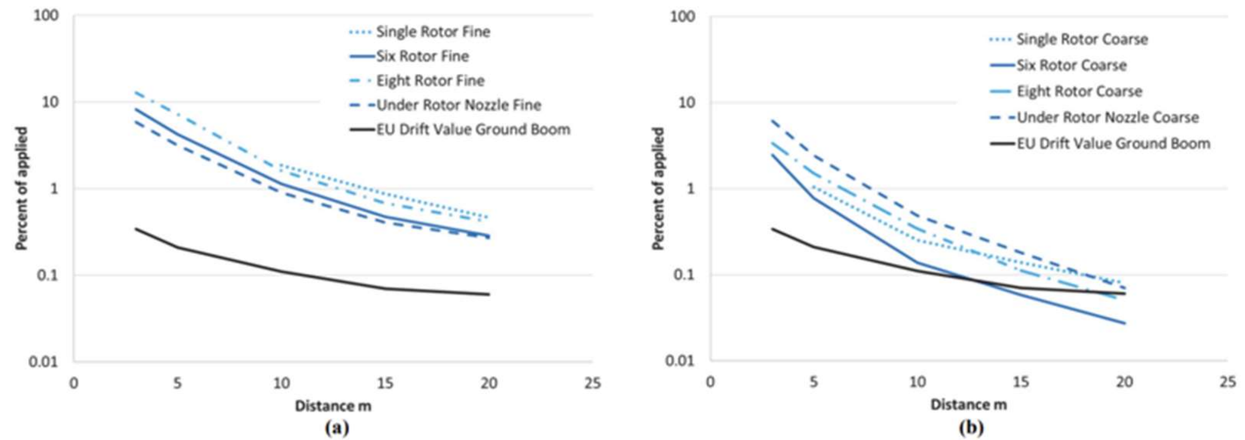


Figure 2. Drift assessment with four different UASS applied at 2 m/s travel speed and 1.5 m altitude compared to the EU basic drift curve for ground boom sprayers applied with two different drop size: (a) fine drop size, and (b) coarse drop size.

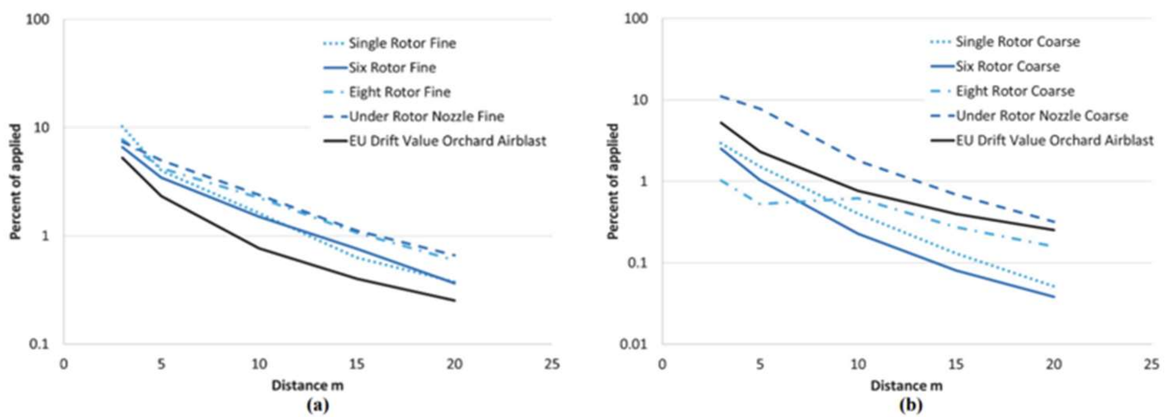


Figure 3. Drift Assessment with four different UASS applying at 2 m/s travel speed and 3.5 m altitude compared to the EU basic drift curve for orchard airblast sprayers applied with two different drop sizes. (a) Fine drop size, and (b) coarse drop size.

Efforts to better understand drift from drones

- Work of OECD Working Party on Pesticides Drone Subgroup chaired by HSE
- Unmanned Aerial Pesticide Application System Task Force (UAPASTF): Unmanned Aerial Pesticide Application Task Force
- Data generation by UAPASTF – the large agchem companies
- Data generation by applicants – tend to be drone operator companies and not the agchem companies

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OPERATOR EXPOSURE

Drone use – agriculture and horticulture

PLAY VIDEO CLIP: TONY WILSON HSE Operator Exposure Day

Operator, worker and bystander exposure: context

Operator

Persons involved in activities relating to the application of a plant protection product (PPP).

Worker

Persons re-entering treated crops to carry out tasks i.e.: harvesting, inspection, maintenance.

Residents & bystanders

Persons residing close to treated areas. Incidental and uncontrolled exposure.

Operator practices

PLAY VIDEO CLIP: TONY WILSON Drone Pesticide Handling

PLEASE PLAY 1 MINUTE ONLY

Current approaches to the risk assessment

- Currently limited exposure data available and no exposure model available.
- Ground-based PPP application exposure estimates are used when assessing drone PPP application.
- Current approach/models not always representative of drone PPP application:
    - Operator mixing and loading PPP into backpack knapsack sprayer.
    - Operator applying PPP via broadcast air assisted sprayer.
    - Resident / bystander exposure – worst case for dermal exposure via spray drift and drift deposition is broadcast air assisted sprayer.
    - Workers – application method does not impact exposure.

Efforts to better understand non-dietary exposure from drones

- Work of OECD Working Party on Pesticides Drone Subgroup chaired by HSE
- Unmanned Aerial Pesticide Application System Task Force (UAPASTF): Unmanned Aerial Pesticide Application Task Force
- Data generation by UAPASTF via a user/operator survey targeting Australia, South America and USA
- Data generation by HSE via a user/operator survey targeting Africa, Asia, Canada, Europe, New Zealand and United Kingdom.
- UAPASTF / OECD Best Management Practices: MASTER-UAPASTF-BMP-final-Sept-2024.pdf

SUMMARY

- Potential gains in worker safety in the use of drones to apply pesticides in certain use cases
- Work is underway to generate data to support the pesticide risk assessment
- Major international regulatory effort to understand how to assess the risk posed by pesticides and evaluate the data used to support commercial authorisations
- A great deal of innovation in this space
- Industry and investor interest
- Government support

Acknowledgements and thanks

Autospray Systems Ltd

Railscape Ltd

Image on slide 13: Weicai, Q. and Panyang, C. (2023). Analysis of the research progress on the deposition and drift of spray droplets by plant protection UAVs, *Nature Scientific Reports 13: DOI:10.1038/s41598-023-40556-0*

Graphs on slide 15: Bonds, J. *et al.* (2024). Spray drift, operator exposure, crop residue and efficacy: Early indications for equivalency of uncrewed aerial spray systems with conventional application techniques, *Journal of the ASABE. 67(1): 27-41. (doi: 10.13031/ja.15646)*