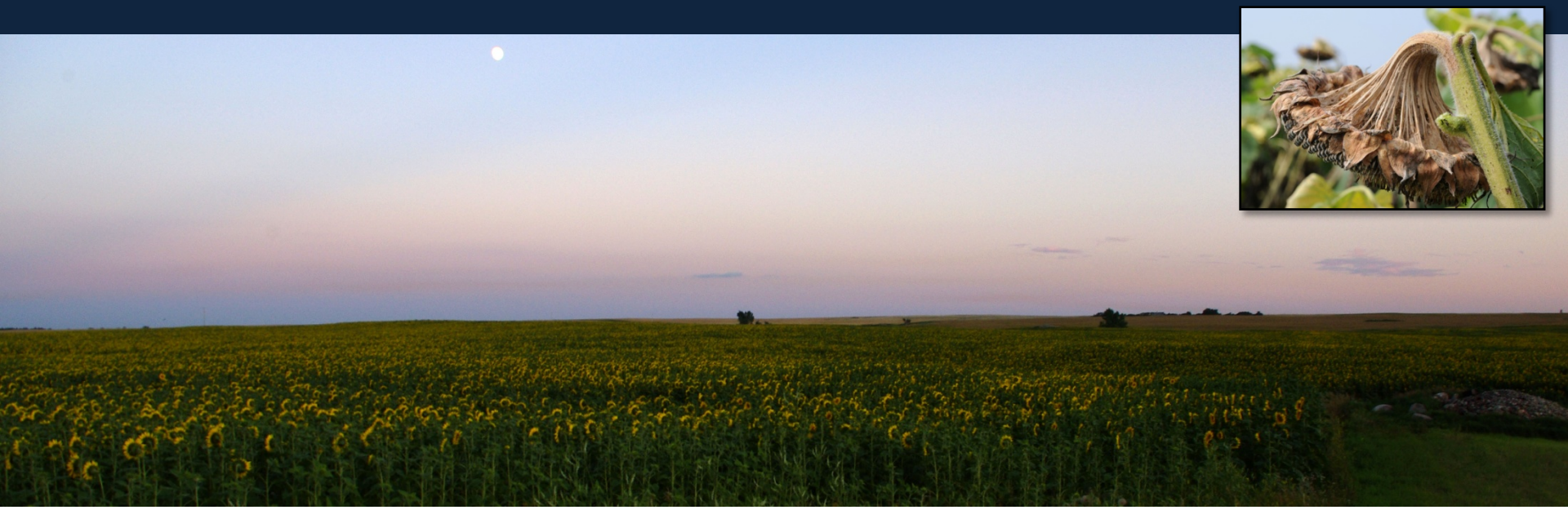
Prospects for using drop nozzles to improve fungicide coverage and control of Sclerotinia head rot



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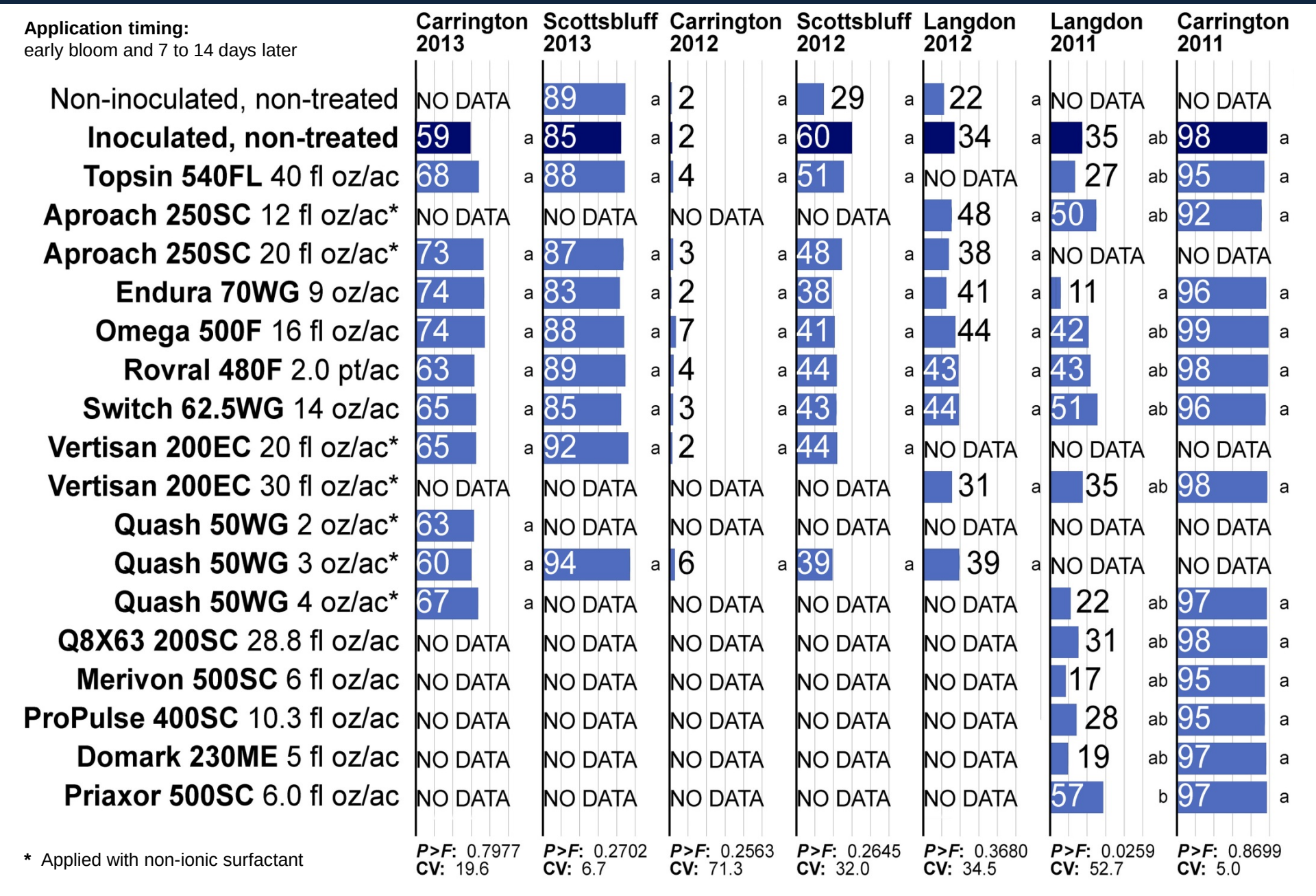
Conclusions from field trials conducted 2011 to 2013:

WHEN APPLIED ACROSS THE TOP OF THE CANOPY, FOLIAR FUNGICIDES EXHIBITED LITTLE OR NO EFFICACY AGAINST SCLEROTINIA HEAD ROT

The poor efficacy was likely due to
the difficulty of achieving satisfactory fungicide coverage.

Sam Markell

Results – Fungicide efficacy

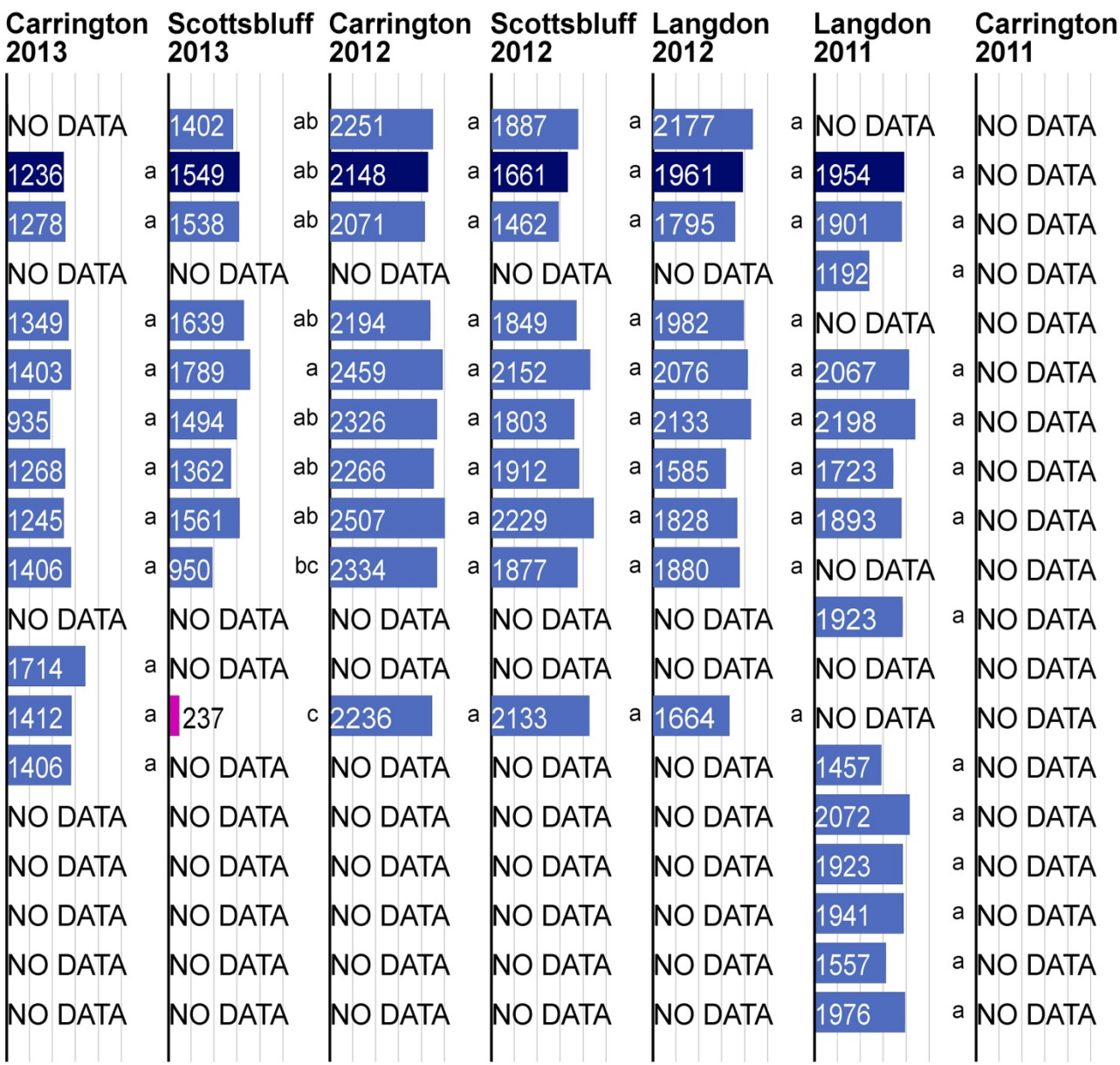


* Applied with non-ionic surfactant

Results – Fungicide efficacy

YIELD (pounds/acre)

Application timing:
early bloom and 7 to 14 days later

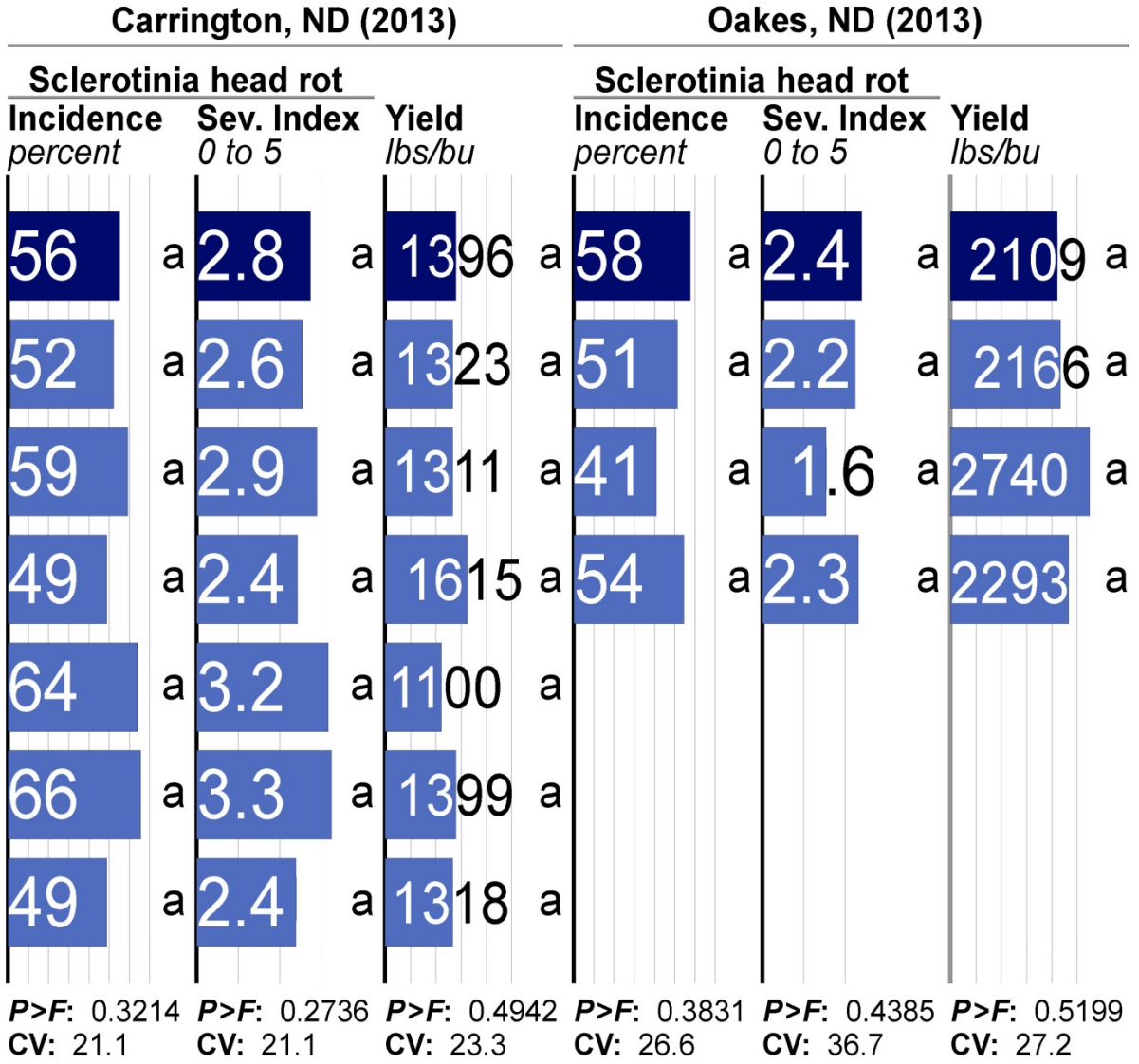


* Applied with non-ionic surfactant

Results – Fungicide efficacy

ONE vs. TWO vs. THREE APPLICATIONS

Application timing:
(A): early bloom
(B): 10-12 days after application A
(C): 8-10 days after application B



Research question:

Can fungicide coverage and disease control be improved by delivering fungicides through drop nozzles mounted on a high-clearance sprayer?

Sam Markell

Methods

- **Confectionary hybrid:** NuSeed ‘Jaguar’
- Planted June 4; overseeded and manually thinned to 17,400 plants/ac (confections)
- **Fungicide applied:** Endura (boscalid) at 8 oz/ac
- **Water volume,** fungicide applications: 20 gal/ac
- **Fungicide application timing:**
  - 82% of plants with an open blossom
  - Among plants in bloom, an average of 30% of disk flowers blooming or already completed bloom
- **Four inoculation treatments:** Non-inoculated, early bloom, mid-bloom, late bloom. **Five replications**. Plots 5 ft x 25 ft.

Methods

- **Assessment of fungicide coverage:**
  - Three rows were treated with fungicide: two rows were used to evaluate disease & yield response, and one row was used to evaluate fungicide spray coverage
  - ‘Spray cards’ (water-sensitive paper designed for assessing spray coverage) were attached to the front of five heads per plot in each of 3 replicates

- **Disease assessments:** Sept. 30 at the R8-R9 growth stage

Methods

- **Drop nozzle from 360 Yield Center:** ‘360 Undercover’

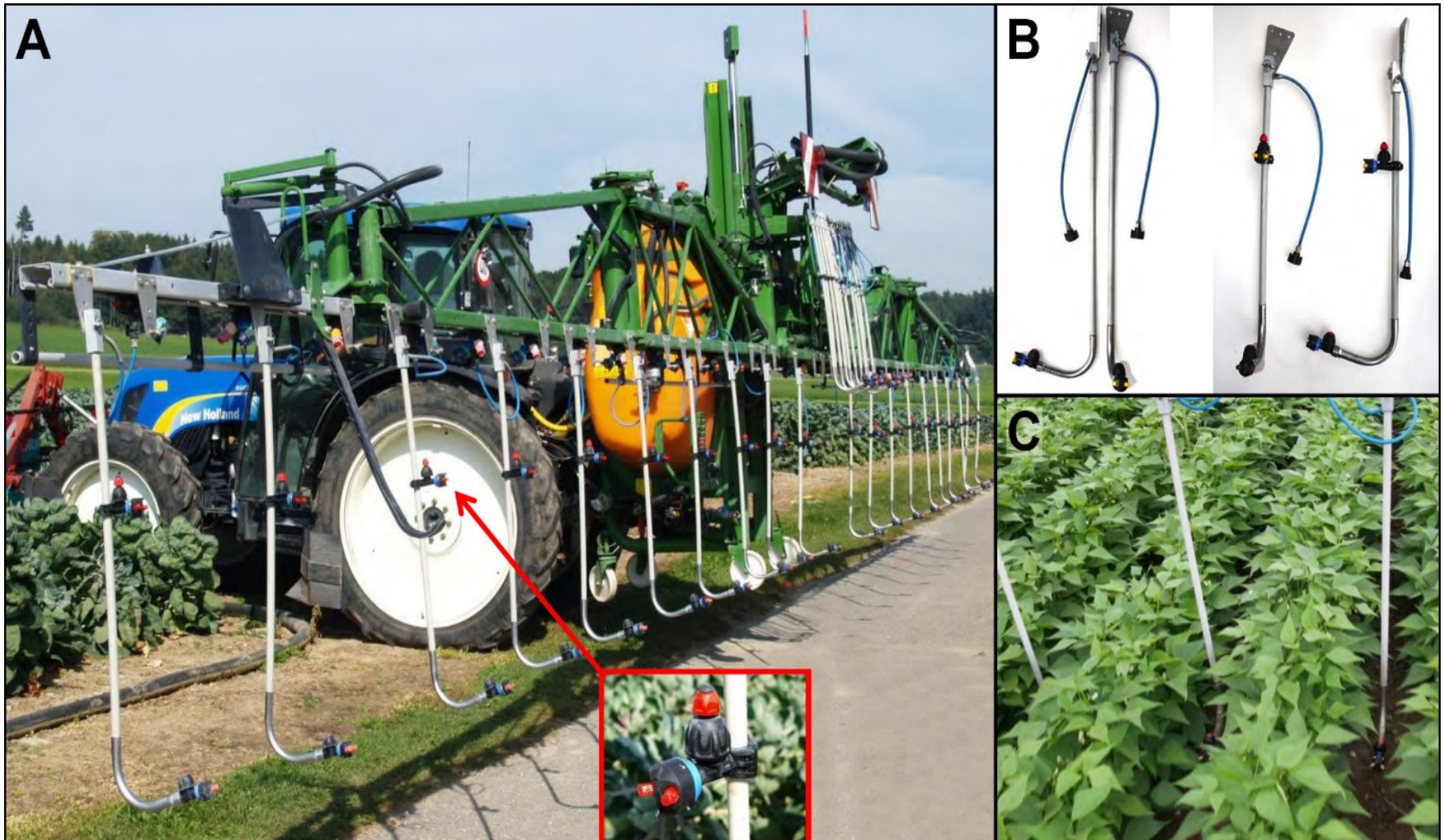
360 UNDERCOVER™

SENSE

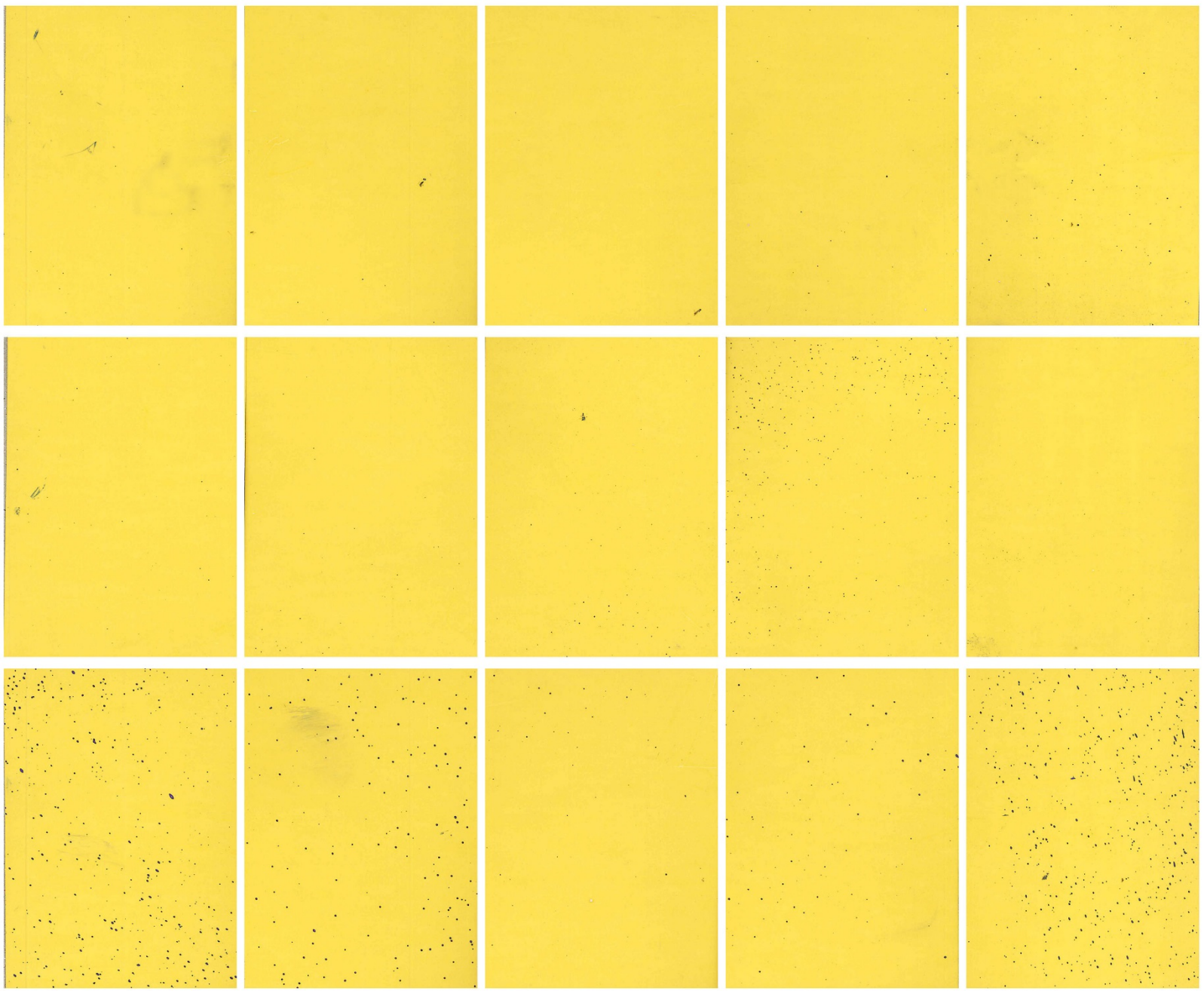
DECIDE

APPLY

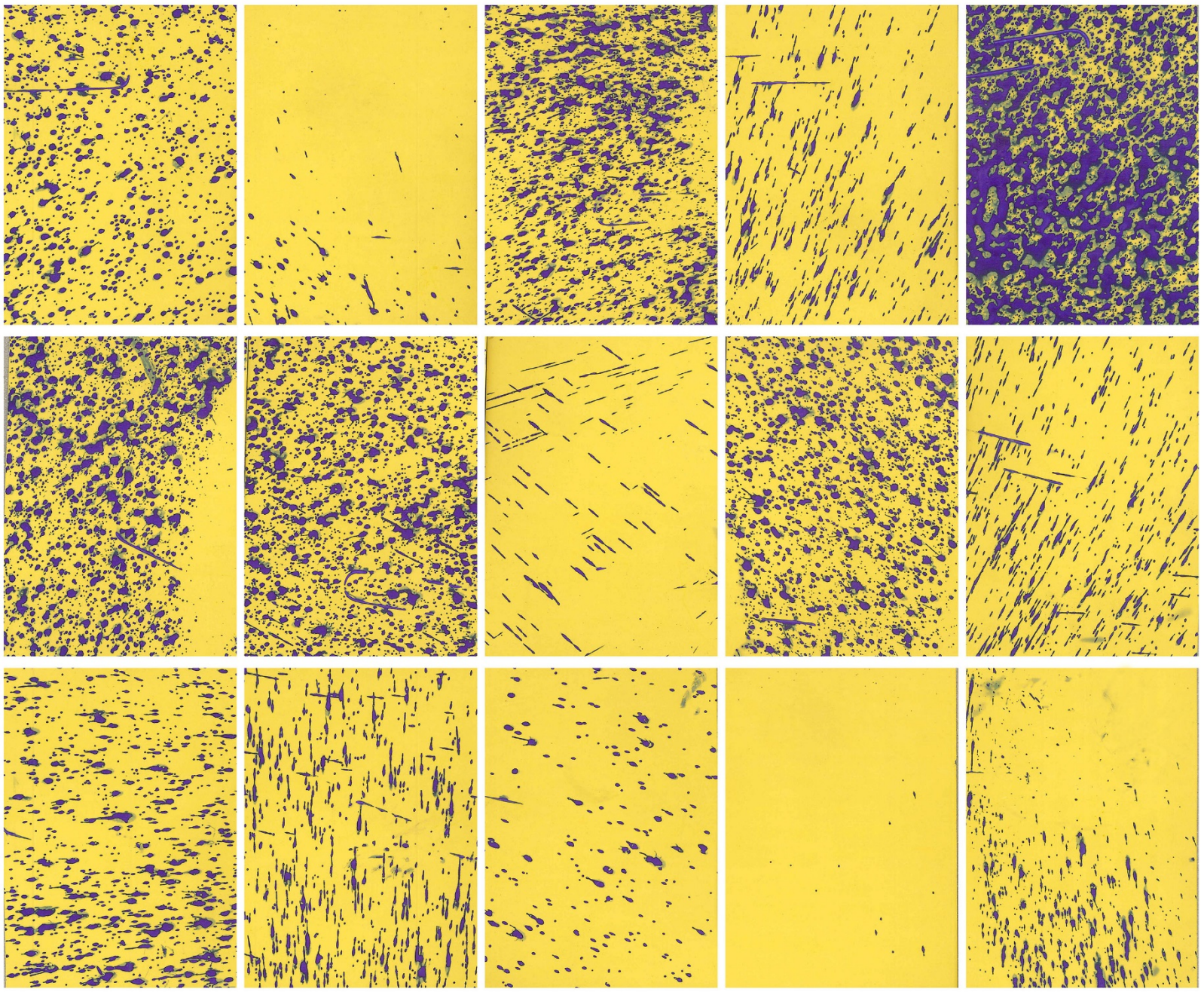
- **Drop nozzles from Kuhn Landmachinen:** ‘FK 90 Plus 1’ and ‘FK 110 Plus 2’



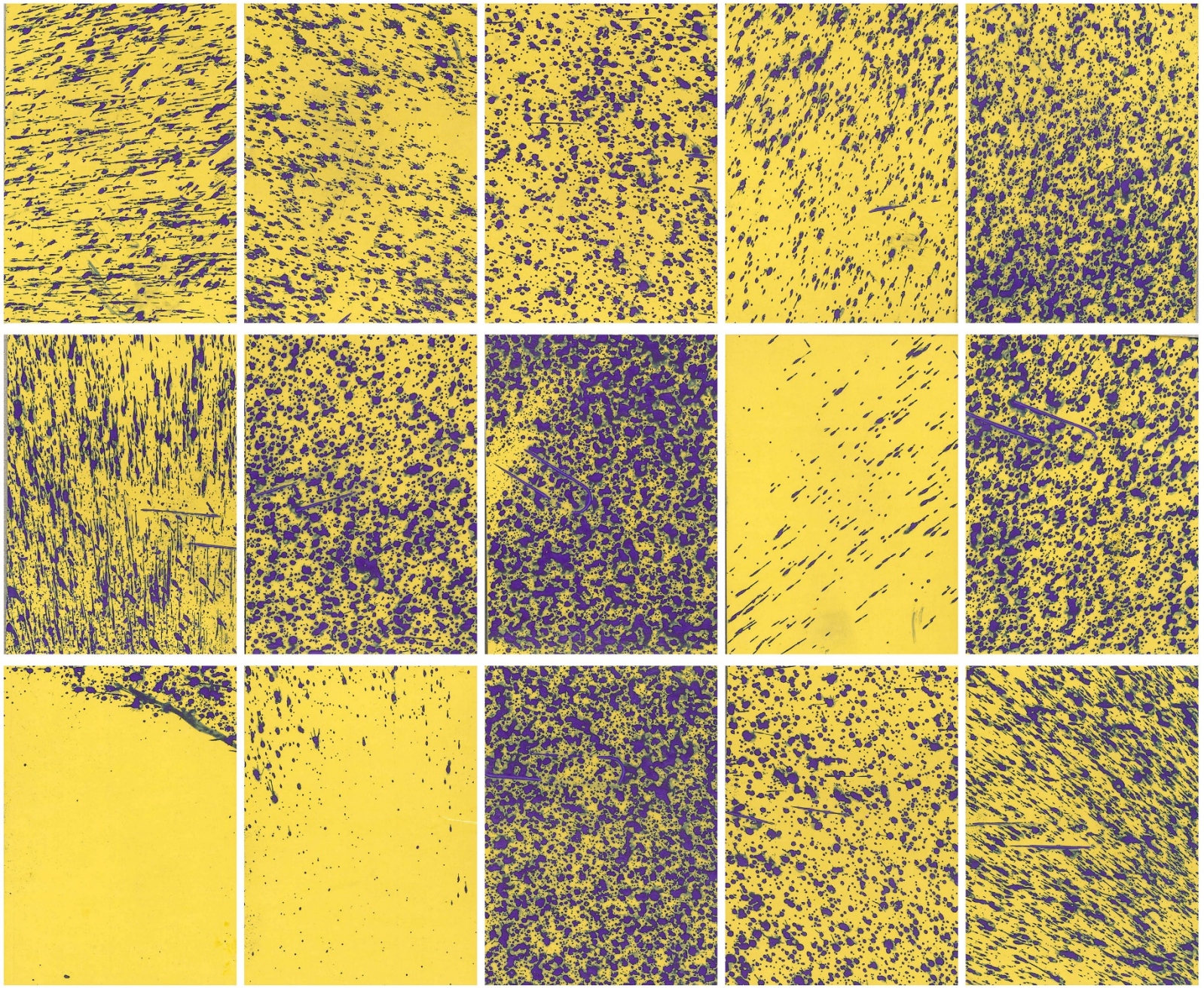
Turbo-tee 11001 flat-fan nozzles mounted directly on boom



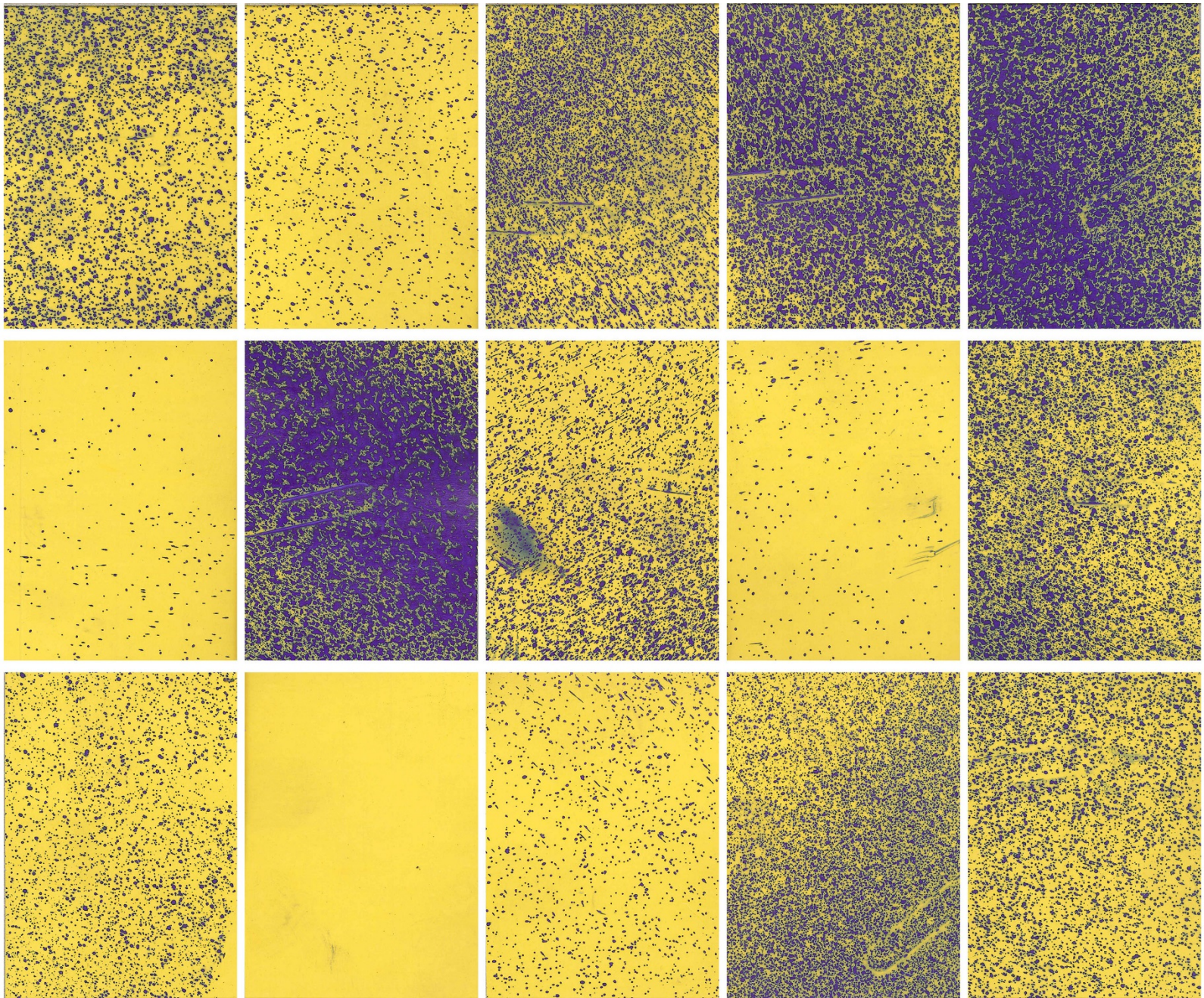
Turbo-tee 11001 flat-fan nozzles; **360 Undercover drop-nozzle**; 40 psi



Turbo-tee 11001 flat-fan nozzles; **360 Undercover drop-nozzle**; 60 psi

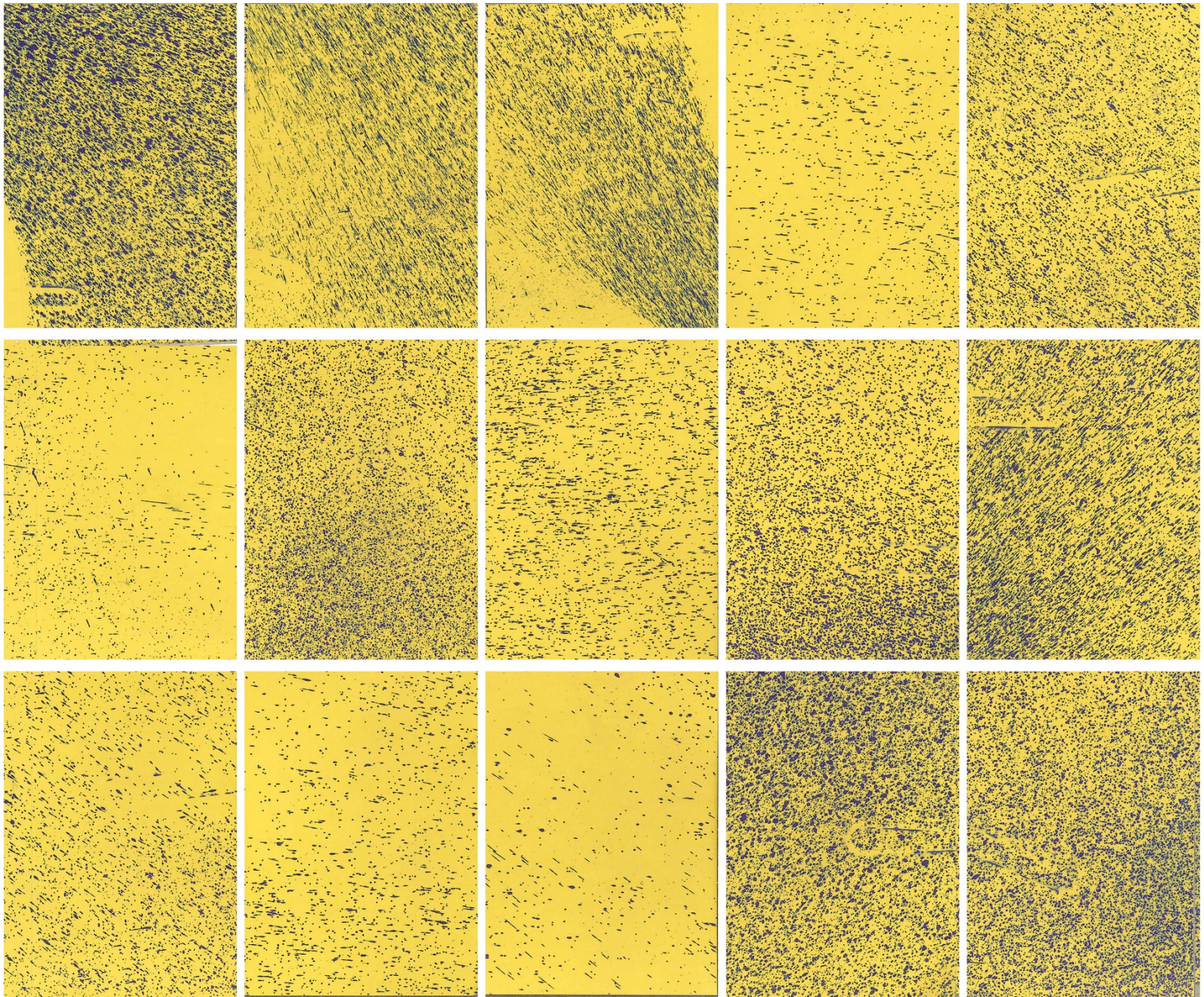


ConeJet TXR8001VK hollow-cone nozzles; **360 Undercover drop-nozzle**; 60 psi

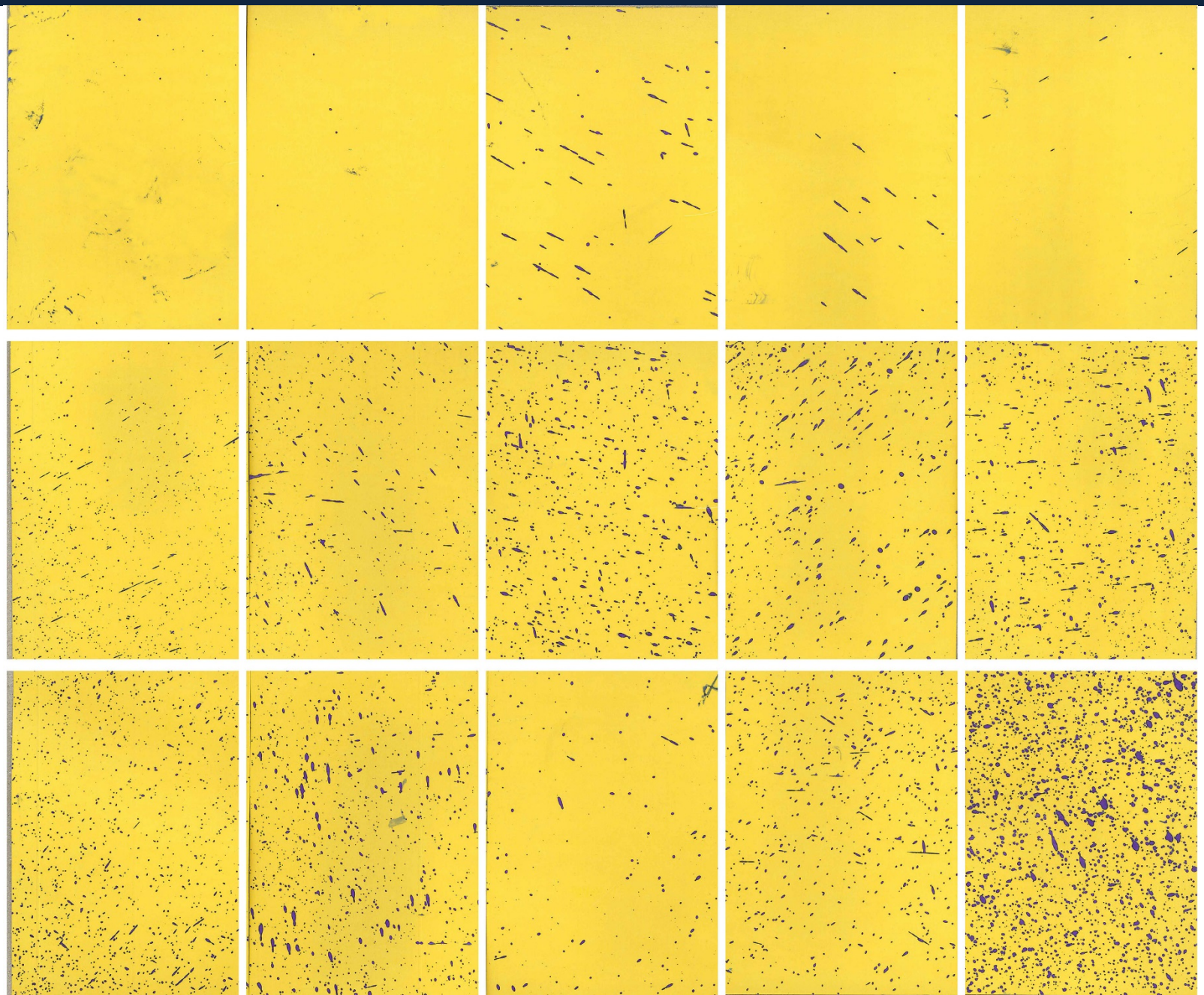


ConeJet TXR8001VK hollow-cone nozzles; **360 Undercover drop-nozzle**; 60 psi

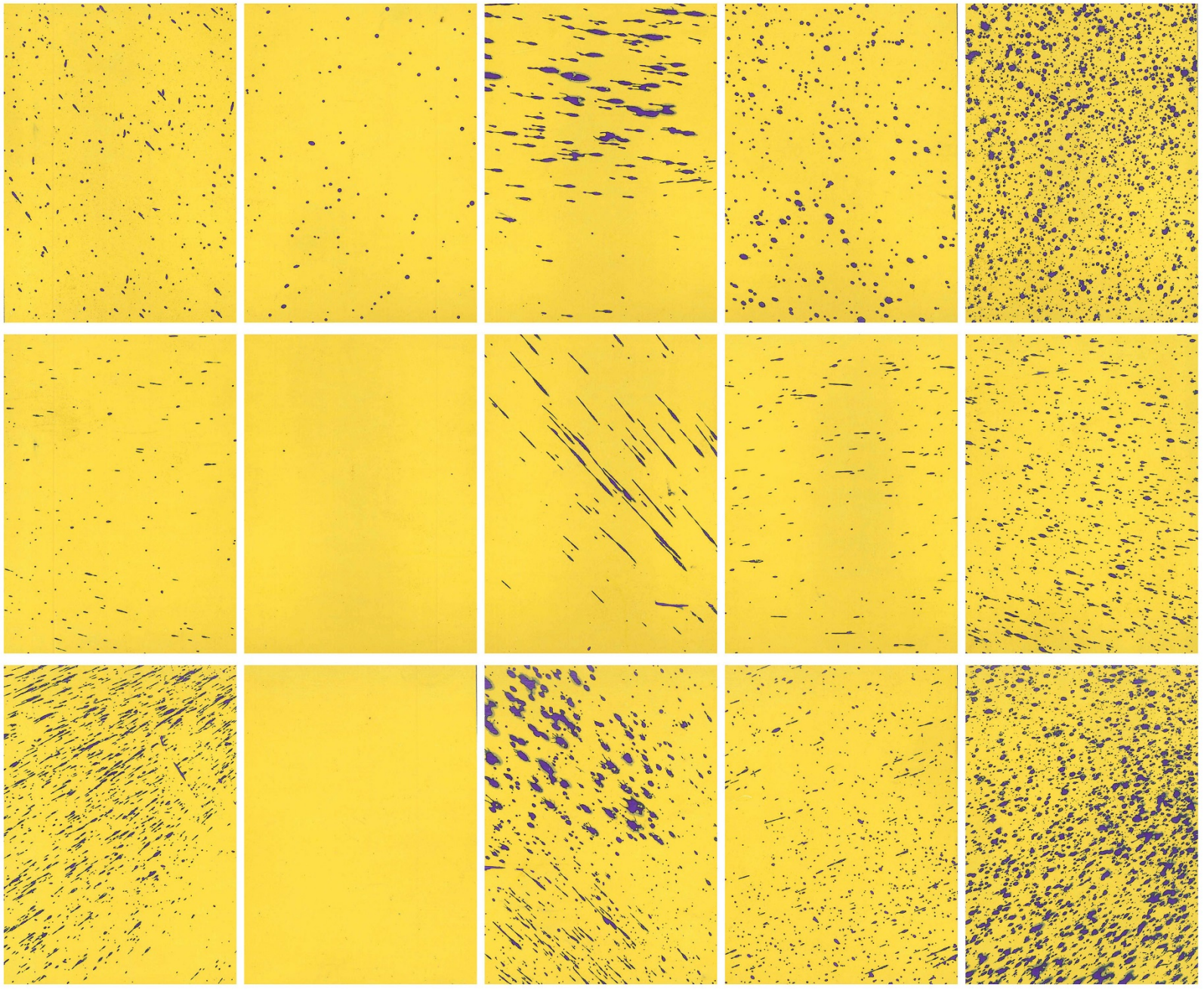
Sprayer driven in opposite direction



Hypro 0.5 DeflecTip flood-fan nozzles; **FK90 Plus 1 drop-nozzles**; 40 psi



Hypro 0.5 DeflecTip flood-fan nozzles; **FK110 Plus 2 drop-nozzles**; 40 psi



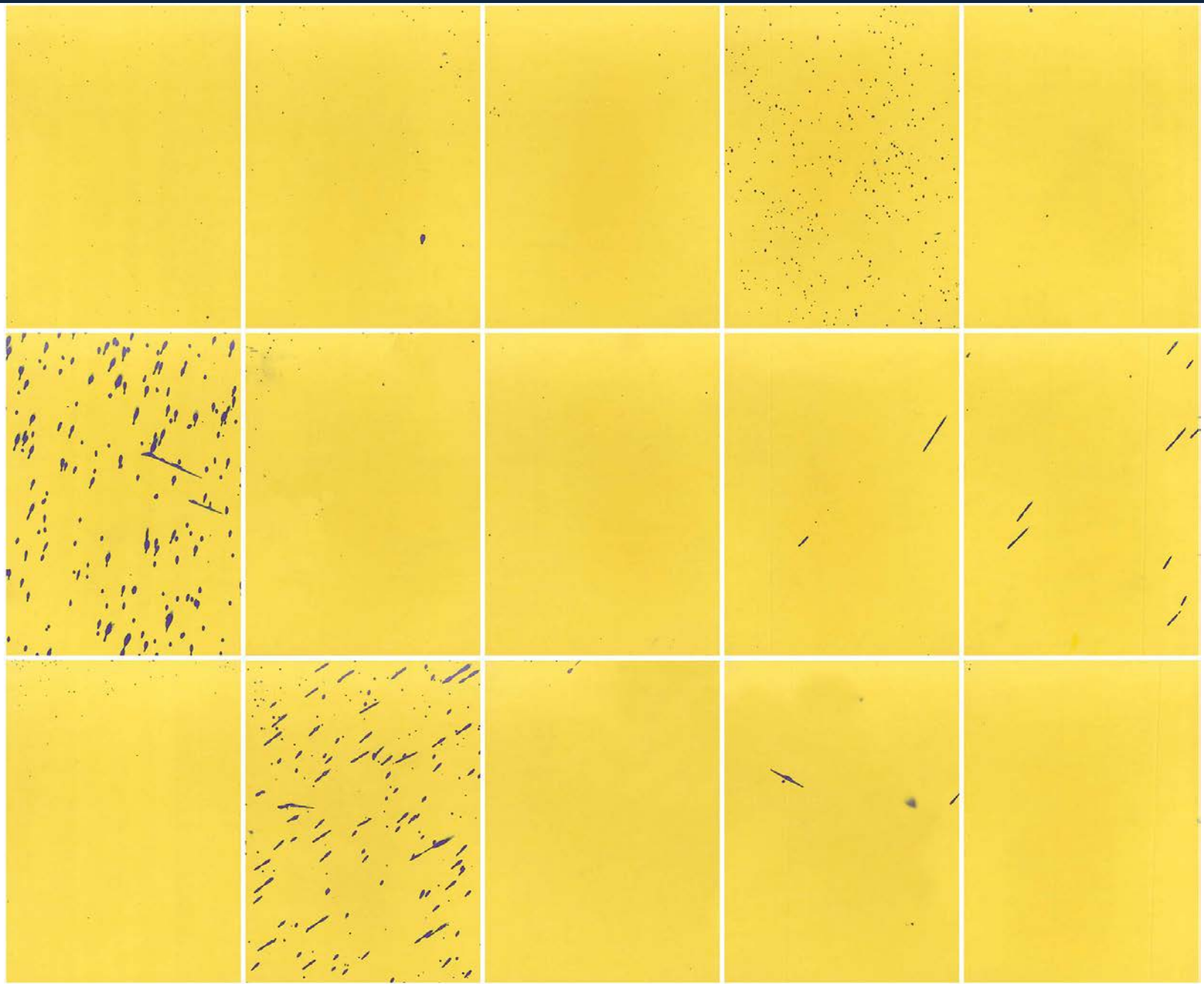
CONFECTION SUNFLOWERS:
Great fungicide coverage ... but no disease control.

			Head rot incidence	Head rot sev. index	
			R8 to R9 growth stage		
			Sept. 30		Yield
			%	%	lbs/ac
Nozzle placement	Nozzle	Pressure			
Non-treated			36 a*	35 a*	1668 a*
Boom (20-inch spacing)	Turbo TeeJet TT11001	40 psi	37 a	36 a	1794 a
Side ports of '360 Undercover' drop nozzle	Turbo TeeJet TT11001	40 psi	37 a	37 a	1753 a
Side ports of '360 Undercover' drop nozzle	Turbo TeeJet TT11001	60 psi	36 a	36 a	1719 a
Side ports of '360 Undercover' drop nozzle	ConeJet TXR8001VK	60 psi	39 a	39 a	1666 a
Side ports of '360 Undercover' drop nozzle	ConeJet TXR8001VK	60 psi	39 a	38 a	1716 a
'FK 90 Plus 1' drop nozzle	30DT 0.5 DeflecTip	40 psi	41 a	40 a	1749 a
'FK 110 Plus 2' drop nozzle	30DT 0.5 DeflecTip	40 psi	38 a	38 a	1744 a
		F:	0.61	0.61	0.59
		P>F:	0.7455	0.7455	0.7608
		CV:	24.9	25.0	14.7

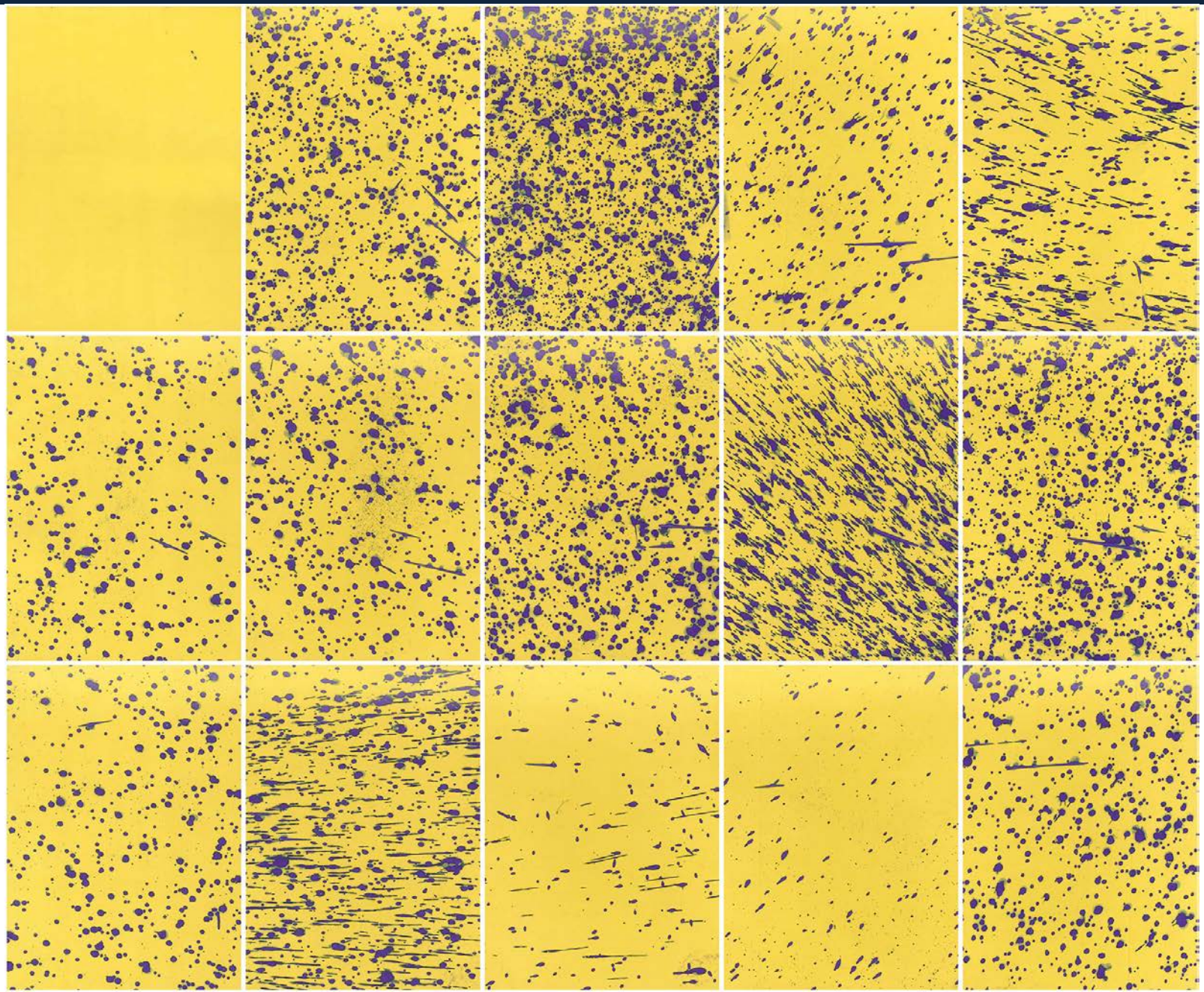
Methods

- **Oilseed hybrid:** Croplan '305 NS DMR'
- Planted June 4; overseeded and manually thinned to 21,000 plants/ac
- **Fungicide applied:** Endura (boscalid) at 8 oz/ac
- **Water volume,** fungicide applications: 20 gal/ac
- **Fungicide application timing:** Approx. 80% of plants with an open blossom and an average of 30% of disk flowers blooming or already completed bloom
- **Four inoculation treatments:** Non-inoculated, early bloom, mid-bloom, late bloom. **Five replications**. Plots 5 ft x 25 ft.
- DUE TO A SEVERE WIND STORM – No yield data. Disease data only from plots with at least 13 plants that remained standing.

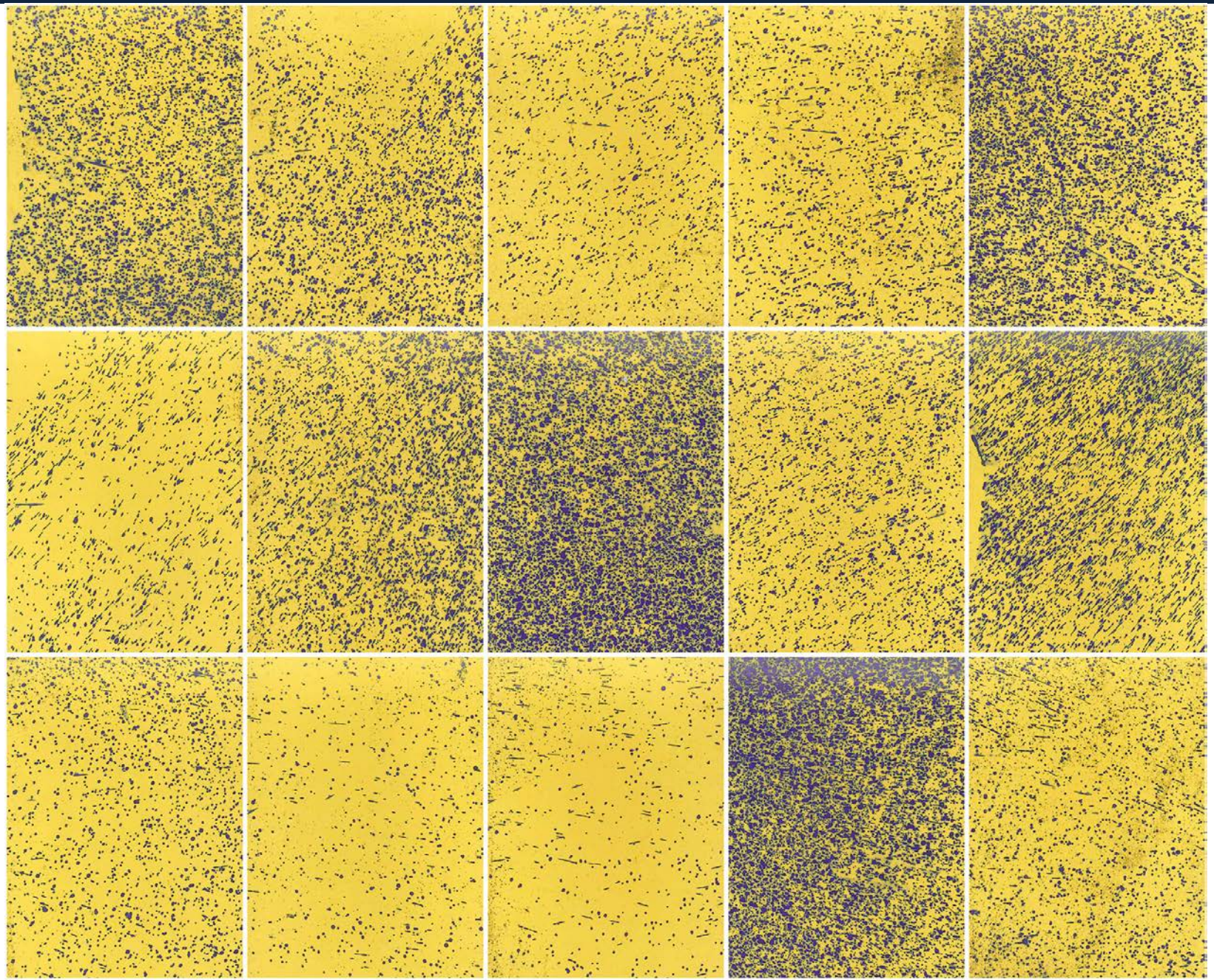
Turbo-tee 11001 flat-fan nozzles mounted directly on boom



Turbo-tee 11001 flat-fan nozzles; **360 Undercover drop-nozzle**; 40 psi

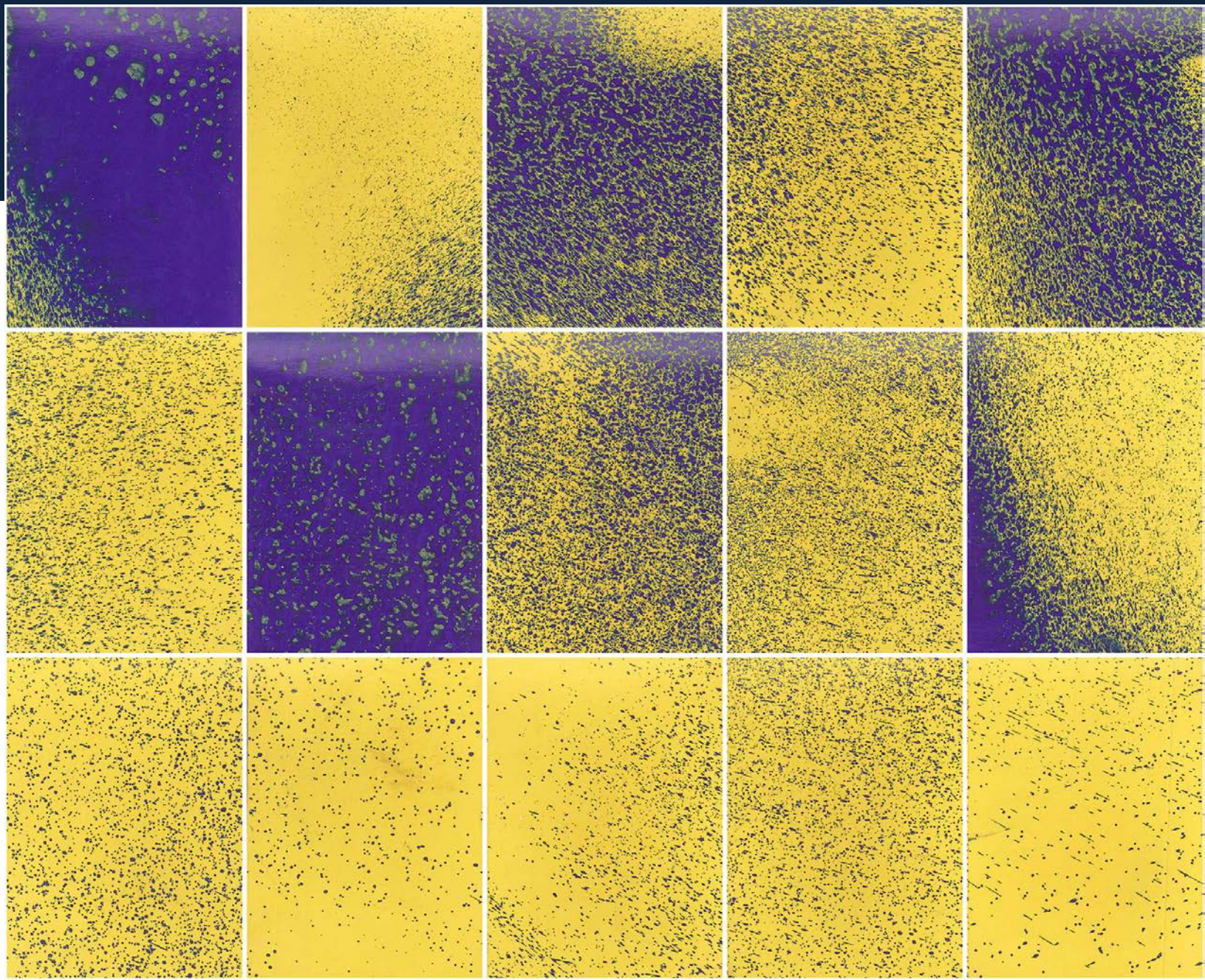


ConeJet TXR8001VK hollow-cone nozzles; **360 Undercover drop-nozzle**; 60 psi

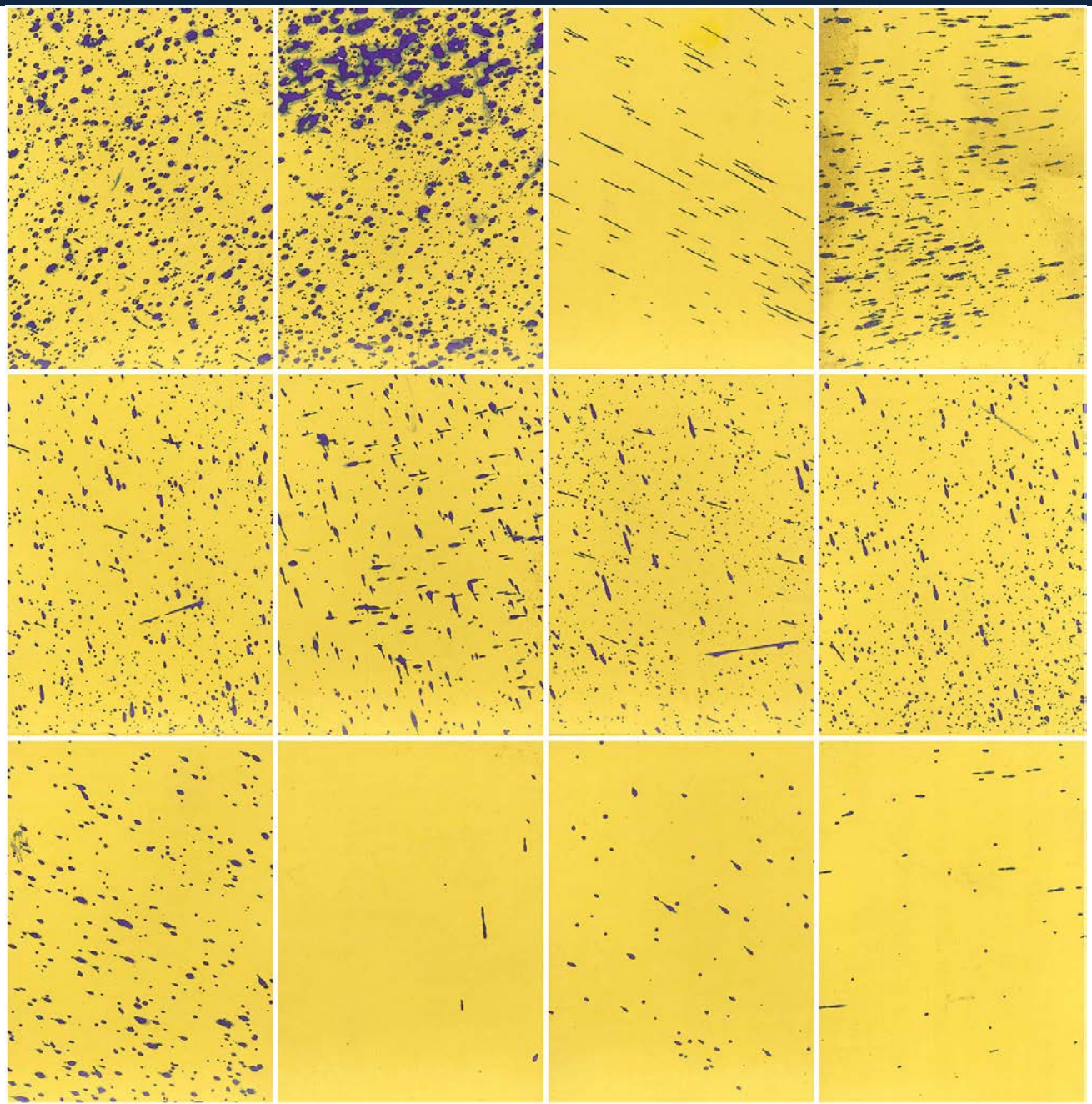


ConeJet TXR8001VK hollow-cone nozzles; **360 Undercover drop-nozzle**; 60 psi

Sprayer driven in opposite direction



Hypro 0.5 DeflecTip flood-fan nozzles; **FK90 Plus 1 drop-nozzles**; 40 psi



OILSEED SUNFLOWERS:
Great fungicide coverage ... but no disease control.

Nozzle placement	Nozzle	Pressure	Head rot incidence	Head rot sev. index
			Oct. 14 | R9 growth stage	
			%	%
Non-treated			29 a*	28 a*
Boom (20-inch spacing)	Turbo TeeJet TT11001	40 psi	22 a	22 a
Side ports of '360 Undercover' drop nozzle	Turbo TeeJet TT11001	40 psi	27 a	27 a
Side ports of '360 Undercover' drop nozzle	ConeJet TXR8001VK	60 psi	28 a	28 a
Side ports of '360 Undercover' drop nozzle	ConeJet TXR8001VK	60 psi	25 a	24 a
'FK 90 Plus 1' drop nozzle	30DT 0.5 DeflecTip	40 psi	26 a	24 a
		F:	0.81	0.83
		P>F:	0.5451	0.5306
		CV:	42.8	43.1

Conclusions

- **Very disappointing disease control results**
- **Very exciting fungicide coverage results**

Conclusions

Questions that must be addressed to develop fungicides as a tool for managing Sclerotinia head rot of sunflowers:

(1) How do we achieve satisfactory fungicide coverage?

(2) What is the optimal fungicide application timing?

(3) Which fungicides are most effective?

Thank you!

This research was made possible by financial support from the **confection growers of the National Sunflower Association** and the **BASF Corporation**