School of Agriculture, Policy and Development

University of Reading

Targeted droplets reduced herbicide inputs in cabbages by at least 85%

Nikolaos Koukiasas | Alistair Murdoch

Background

Weed control in field vegetables is increasingly challenging due to the loss of herbicide actives and the demand for more sustainable crop production. The need for selective herbicides is removed if droplets of herbicides can be targeted to the leaves of the weeds, because the chemical is applied to plants individually. A non-selective, broad spectrum, systemic herbicide such as glyphosate needs to be used.

Aims and objectives

- The overall project aims to develop a robotic weeder for field vegetables (Fig.1).
- This poster describes research carried out at Sonning Farm, near Reading to test the efficacy of glyphosate droplet applications to control the naturally occurring weed population in a cabbage crop.

Fig. 1: Prototype agricultural robot produced by collaborators, Concurrent Solutions llc.

Methods

- Savoy cabbages were transplanted at the 4-leaf stage on 2 June 2016
- Randomized complete block design with 4 blocks.
- Treatments applied were (Fig.2):
  - **Weed-free** (hand-weeded)
  - **Weedy** (no weed control)
  - **Pre-em** (Stomp Aqua, 455 g/l pendimethalin at 2.9 l/ha before transplanting)
  - **Band Spray** (Roundup Biactive, 360 g/l glyphosate, at 1.5 l/ha between the rows 3 weeks after transplanting)
  - **Droplet x1** (36 µg glyphosate per weed, 3 weeks after transplanting)
  - **Droplet x3** (36 µg glyphosate per weed, 3, 5, 7 weeks after transplanting)
  - **Droplet x3 (adj)** (glyphosate after 3, 5 and 7 weeks:
    - Weed ground cover < 1 cm^2: 9 µg per weed
    - Weed ground cover > 1 cm^2: 18 µg per weed
  - **Band + Droplet x1** (Band Spray 3 weeks after transplanting followed by Droplet x1 (36 µg glyphosate per weed), 5 weeks after transplanting)
- Cabbages were harvested and weed dry weights assessed after 18 weeks (Fig.3).

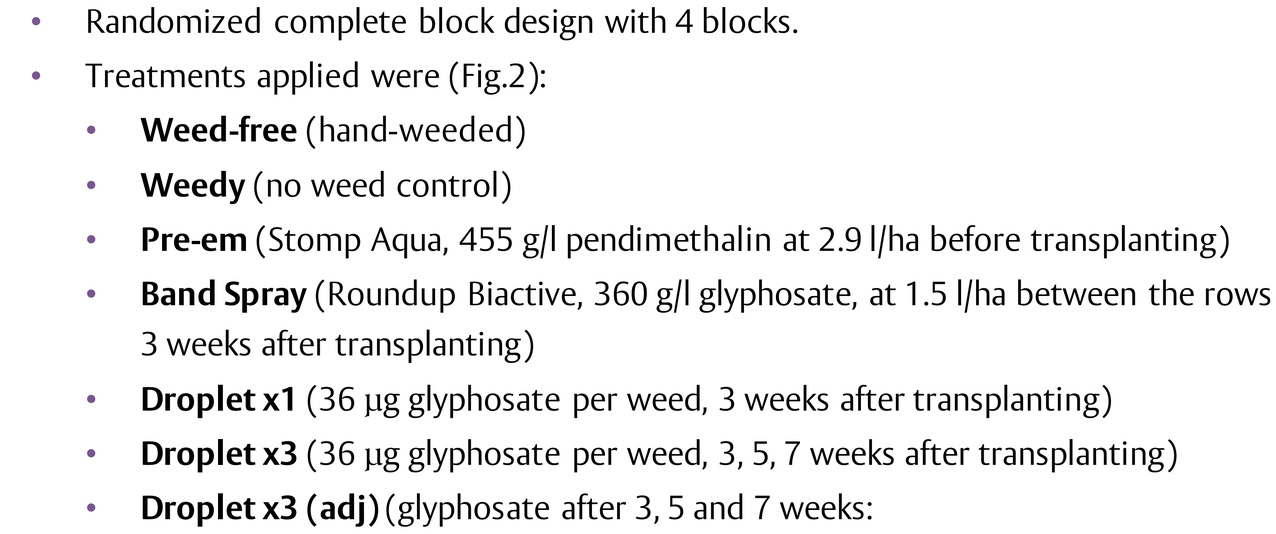

Fig. 2: Savoy cabbages seven weeks after transplanting showing weedy, weed-free, pre-emergence and droplet x3 plots.

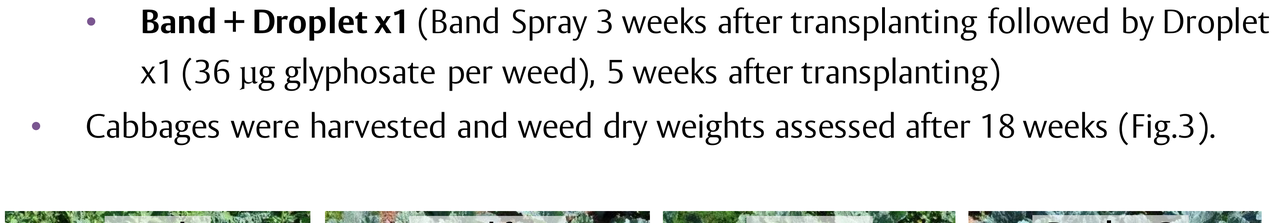

Fig. 3: Trimmed savoy cabbage heads at harvest after application of different weed control treatments.

Results

- Droplet applications after 3, 5 and 7 weeks gave most effective weed control (the Droplet x3 treatment):
  - Amount of herbicide reduced by 94% compared to the Pre-em treatment and by 85% compared to the Band Spray (Table 1)
  - Weed dry biomass reduced by 92% (Fig. 4)
  - Yield not significantly lower than the weed-free (Fig. 5)
- Pre-em and Band Spray treatments yielded significantly lower than the weed-free (Fig. 5)
- The single droplet treatment (Droplet x1) gave poor control

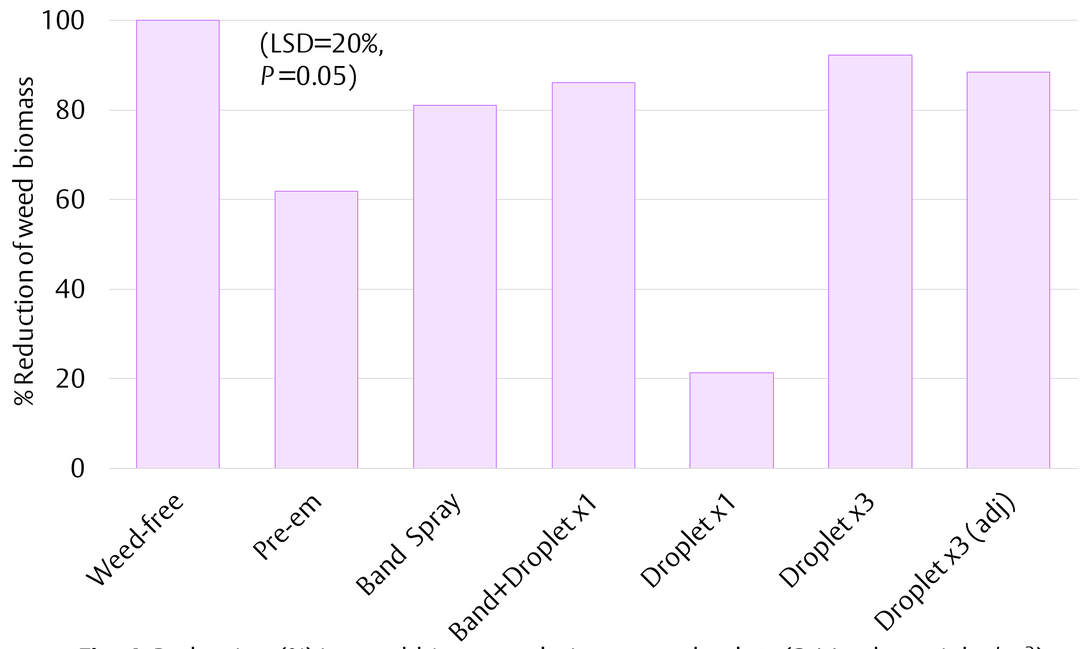

Fig. 4: Reduction (%) in weed biomass relative to weedy plots (244 g dry weight /m^2)

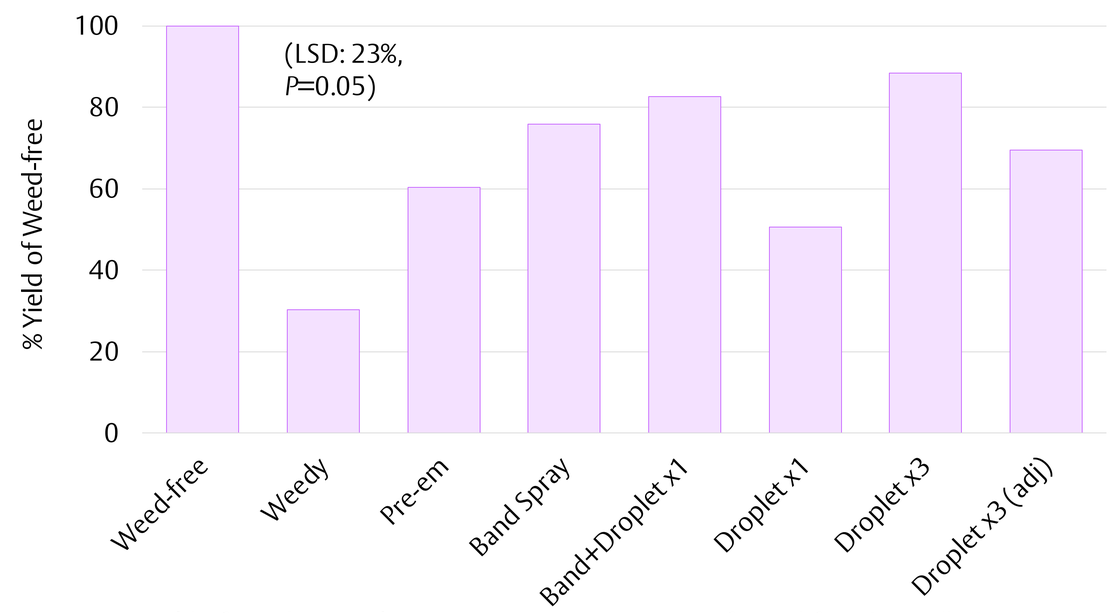

Fig. 5: Yield of weed control treatments as a percentage of Weed-free (241 t/ha)

Table1: Average amount of herbicide applied and % reduction relative to Pre-em and Band Spray.

Treatments	Average amount of herbicide applied (g of AI/ha)	% Reduction relative to Pre-em	% Reduction relative to Band Spray
Droplet x1	53.9	96	90
Droplet x3	83.3	94	85
Droplet x3 (adj)	119	91	78
Band Spray	540	59	0.0
Band+Droplet x1	562	57	-4.1
Pre-em	1320	0.0	-144

Conclusions

- The Droplet (x3) treatment reduced herbicide inputs by 85 to 94%, with 92% weed control and satisfactory crop yields.
- The efficacy of droplet applications for controlling natural weed infestation in cabbages was demonstrated.

Acknowledgements

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Contact information

Email: n.koukiasas2@pgr.reading.ac.uk | a.j.murdoch@reading.ac.uk