

Testing image-based site-specific weed control in cereals

T. W. Berge, S. Goldberg, K. Kaspersen, J. Netland, Ø. Overskeid, T. Stølan
*Bioforsk - Norwegian Institute for Agricultural and Environmental Research, Plant Health
and Plant Protection Division, Ås, Norway*
Therese.Berge@bioforsk.no

Automatic weed detection and valid thresholds are required for operational patch spraying (PS). The aim of the present work was to test a first version of an object-oriented algorithm, *Weedcer*, which automatically estimates ground covers of broadleaved weeds and cereal in RGB images. Both real-time and map-based trials (imaging and spraying in one or two operations, respectively) were conducted in spring cereals and winter wheat in SE Norway in 2009.

The version of *Weedcer* tested estimates relative weed cover (RWC) and relative *Tripleurospermum inodorum* (mayweed) cover (RMC). RWC is the cover of all broadleaved weeds divided by the total plant cover. RMC is the cover of *T. inodorum* divided by the total plant cover. Nadir view images (appr. 0.06 m²) were acquired with a field robot (1.8 km h⁻¹) in grids 0.5-1m × 3-3.5m during spring, the normal time for broadleaf herbicide application in Norwegian cereals. The biological threshold (BT) is the weed infestation level giving the same mean yields in sprayed and unsprayed units.

In the three map-based trials, the mean RWC and RMC pr management unit (12m × 12.5m) were tested as thresholds. One to five days after imaging, iodosulfuron-methyl-sodium was sprayed with farmers' equipment. In the 1st trial (winter wheat), RMC was a better predictor of yield loss than RWC. Data of this trial indicated that a BT based on mean RMC should be < 0.015. In the 2nd trial (winter wheat), a BT of mean RWC = 0.027 was indicated (27% herbicide savings). In the 3rd trial (spring barley), a BT of mean RWC=0.057 was indicated (43% herbicide savings).

The three real-time trials were conducted with the robot. The sprayed units were 3.5m × 3m and the unsprayed units 3.5m × 0.5m. There was no difference in mean yield between PS and broadcast application in any of these trials. In the two spring barley trials, the mean PS weed density at harvest was ≤ than the weed density after broadcast application (herbicide savings were 22% and 97%). The tested threshold, a weighted moving average of RWC image⁻¹ = 0.042, thus seemed appropriate for spring barley. The threshold for spring wheat should probably be smaller, as indicated by the weed density at harvest.

A set of thresholds for patch spraying broadleaved weeds based on RWC (RMC where high mayweed infestation occurred) and *Weedcer* were estimated. These threshold parameters- and values need further testing. *Weedcer* appeared useful, but with further weed species discrimination it will be even more successful.