

Less intra-row weeds - experiences with a punch planter and a cycloid hoe based on GPS

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Experiences with a punch planter and an intelligent rotary tine weeder are summarized. The objectives were to investigate (1) to what extent punch planting and pre-emergence flame weeding can reduce intra-row weed emergence in direct sown crops like onion, carrot and sugar beet, (2) to what extent an intelligent intra-row weeder, a cycloid hoe based on RTK-GPS technology, can control intra-row weeds without damaging the crop in direct sown crops, (3) and to what extent there exists synergy between punch planting with pre-emergence flame weeding and mechanical intra-row weeding.

In punch planting, holes are punched into the ground and seeds are inserted into them, with minimum soil disturbance outside the holes. This is expected to reduce weed emergence due to lack of soil disturbance as compared to normal sowing. Weeds that emerge before crop emergence are controlled by pre-emergence flaming.

The cycloid hoe unit consists of eight sigmoid-shaped tines that are placed in a circle around an axis. When the axis turns around and the implement moves along the rows, the tines describe a cycloidal path. The tines can be released to allow individual tine rotation to avoid collision with the crop plants. The implement works on the basis of RTK-GPS crop maps.

Experiments show that there are potentials in punch planting in slow germinating row crops in terms of reduced weed emergence. Punch planting with pre-emergence flame weeding reduced the average intra-row weed density by about one third in onion and carrot but there was no effect in sugar beet as compared to normal sown plots with flame weeding. However, the experiments also show that the prototype of the punch planter needs innovation in order to make use of the full potential of the punch planting principle. Earlier experiments with punch planting carried out by hand showed significantly better results (Rasmussen, 2003)

The cycloid hoe showed unexpected poor results, which challenges our understanding of crop-weed selectivity of intelligent tine cultivators. There were no positive interactions between punch planting and the success of mechanical intra-row weed control even though weeds were smaller in the punch planted plots. Results will be published soon (Rasmussen *et al.* 2011a; 2011b).

References

- Rasmussen J (2003) Punch planting, flame weeding and stale seedbed for weed control in row crops. *Weed Research* **43**, 393-403.
- Rasmussen J, Griepentrog HW, Henriksen CB & Nielsen J (2011a) Test of an automated intelligent intra-row weeder (cycloid hoe) and an alternative sowing technique (punch planting) to improve the selectivity of mechanical intra-row weed control (submitted).
- Rasmussen J, Henriksen CB, Griepentrog HW & Nielsen J (2011b) Punch planting, flame weeding and delayed sowing to reduce intra-row weeds in row crops (submitted).