Short-term effect of pre- and post-emergence herbicides applications on yellow nutsedge (*Cyperus esculentus*)

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Yellow nutsedge (*Cyperus esculentus*) is an invasive and highly problematic weed species with strong reproductive potential, mainly through tubers but also via seeds. In Switzerland, it has spread considerably, posing a risk to crop production in some areas, particularly in vegetable production, where herbicide options are limited and crop density can be low. An effective control is challenging and requires a long-term, holistic strategy. Promising approaches include combining soil tillage, with pre-emergence soil herbicides (PRE) and post-emergence (POST) mixtures, particularly in late-sown maize (Keller et al., 2018), as well as splitting POST herbicides to enhance efficacy (Keller et al., 2014).

This study evaluated two short-term field trials aiming to (i) assess the impact of soil incorporation of PRE herbicides (trial A), and (ii) test the effect of POST strategies with single or split applications (trial B) for *C. esculentus* control. Both trials were set up as a randomized complete block design (n=4, 10.5 m² plots) on bare soil in an infested field in the Rhine Valley of St. Gallen, Switzerland, from June 16 to July 29 2025. Due to the short duration, the trials served as preliminary study intended to provide practical insights for long-term trials in the future. Trial A compared Spectrum and Adengo with and without soil incorporation, and an untreated control (Table 1). Trial B assessed six strategies (i) PRE + POST (Spectrum; Callisto + Lentagran EC) (ii) POST Callisto + Lentagran, (iii) POST split dose Callisto + Lentagran, (iv) POST Titus + Lentagran, (v) POST split dose Titus + Lentagran, and (vi) an untreated control. PRE was applied (and incorporated) shortly after seed bed-preparation on June 16. POST was applied on July 2 (POST), and for split treatments additionally on July 11. To quantify the infestation level (tuber bank) before and after the trials, mixed soil samples (0–20 cm) were collected from each plot and placed in the greenhouse to germinate the tubers, where the number of sprouts was counted after 4 and 8 weeks. Surface cover of *C. esculentus* and other weeds was assessed in the field. Trials were terminated 38 days after PRE and 12 days after the last split application to prevent further spread.

After soil tillage and seed bed preparation, *C. esculentus* germinated rapidly and reached high surface cover in the untreated control, averaging 78% (50–95%) and 54% (40–75%) in trial A and B respectively, supressing most other weed species (10% cover in A and 16% in B). All herbicide treatments showed significantly lower *C. esculentus* cover compared to the controls. Incorporation of soil-active herbicides in trial A had a significant effect on reducing weed cover and shoot number, particularly with Spectrum. However, as the mechanical impact was not tested isolated, the effect cannot be solely attributed to the herbicide. In trial B, only the untreated control showed a significant increase in *C. esculentus* cover over time, whereas the treated plots maintained stable infestation levels, or tended to decline. Split application did not enhance efficiency, presumably due to suboptimal timing (> 20 cm weed height). Due to the short trial duration and pending final soil sample analyses, broader conclusions remain limited. As expected, none of the POST treatment could fully control *C. esculentus*, though most succeeded in limiting growth over the course of the trial.

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Table 1. Treatments in trial A and B. PRE = Pre-emergence application; Post = Post-emergence application; Treatments with incorporation = incorporation into 10–15 cm. Split = splitting of herbicide treatments

Treatment	Dose	Active Ingredient	Application date
Trial A			
Untreated Control	-	-	-
Spectrum- incorporated	1.2 L ha^{-1}	Dimenthenamid-P	PRE: June 16 with incorporation
Spectrum	1.2 L ha^{-1}	Dimenthenamid-P	PRE: June 16 without incorporation
Adengo - incorporated	0.27 L ha^{-1}	Isoxaflutole + Thiencarbazon	PRE: June 16 with incorporation
Adengo	0.27 L ha^{-1}	Isoxaflutole + Thiencarbazon	PRE: June 16 without incorporation
Trial B			
Untreated Control	-	-	-
Spectrum; **Callisto + Lentagran EC**	1.2 L ha^{-1} 1 + 1.5 L ha^{-1}	Dimenthenamid-P; Mesotrione + Pyridate	PRE: June 16 Post: July 2
Callisto + Lentagran EC	1 +1.5 L ha^{-1}	Mesotrione + Pyridate	POST: July 2
Callisto + Lentagran EC - split	0.5 + 0.75 L ha^{-1}	Mesotrione + Pyridate	POST: July 2 and July 11
Callisto + Titus	1 L ha^{-1} + 40 g ha^{-1}	Mesotrione + Rimsulfuron	POST: July 2
Callisto + Titus - split	0.5 L ha^{-1} + 20 g ha^{-1}	Mesotrione + Rimsulfuron	POST: July 2 and July 11

References

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