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Effect of SmartBlock® and 1,4-DMN, sprout suppressants, on the nitrogen use efficiency and growth of potatoes

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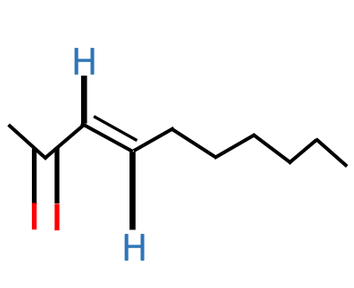
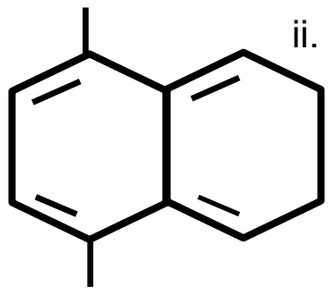
INTRODUCTION & AIM

i. Postharvest sprouting reduces tuber quality and compromises optimal physiological conditions at planting

Solution:
Sprout suppressant



3-decen-2-one



1,4-DMN

ii. 3-decen-2-one is found in food products & DMN in potato peels (Thoma & Zheljazkov, 2022)

ii. 3-decen-2-one (SmartBlock®) & 1,4-DMN are proven effective in sprout control, but research on their long-term effects is limited.

Aim: Determine the effect of SmartBlock® and 1,4-DMN, on the nitrogen use efficiency and growth of potatoes

METHODOLOGY

i. Postharvest treatment followed:
Mashishi et al., 2025

0.100 mL/kg suppressant dosage

Applied to:

Mondial & Panamera seeds potatoes

Frequency

Every 7 days (Total of 4 applications)

Storage setup

Fig 1. Storage setup

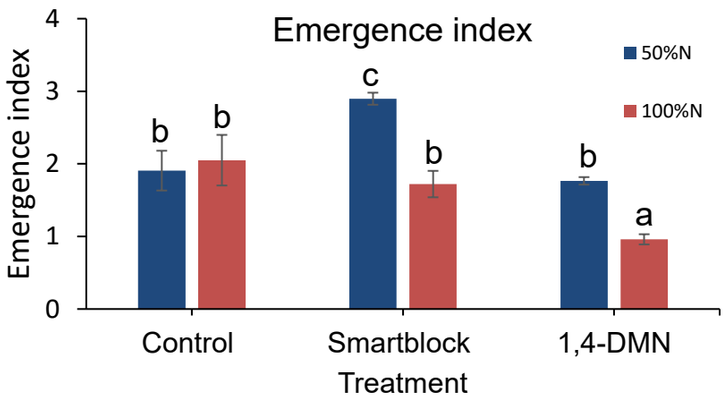
ii. Seeds were planted after 1 week of no treatment.

Fig 2. Field trial

Field trial
- Split-split plot design
- Main block: 50 & 100% Nitrogen application
- subplot: suppressant
- cultivars assigned to plots with 3 replicates.

iii. **Data collection:** Emergence index, plant height, stem number, Nitrogen use efficiency (NUE) as Yield/ N input. GenStat 24th version was used for data analysis.

RESULTS & DISCUSSION

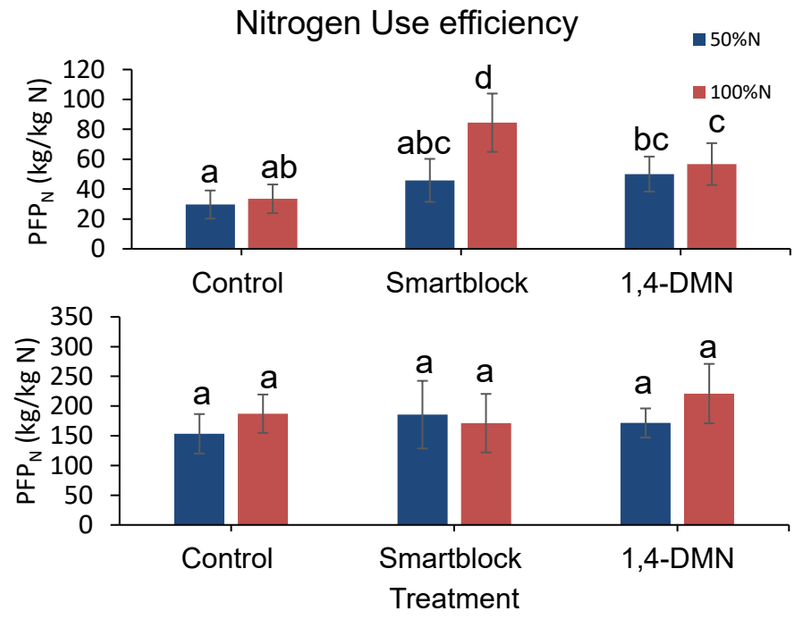


(i) Emergence index (EI) was delayed under 1,4-DMN treatment compared to control at 100% N. 1,4-DMN effects are reversible, eventually the treated plant may emerge leading to slower emergence.

Table 1. Panamera & Mondial cultivar plant height. Values are means ± standard deviation. same letter are not significantly different at $p < 0.05$ according to the Bonferroni test.

	Plant height (cm)	
Treatment	Panamera	Mondial
50%N Control	33.9±6.3 ab	45.31±5.76 a
50%N SmartBlock	39.6±7.4 b	53.78±11.65 ab
50 %N DMN	31.8±5.4 a	52.44±7.97 ab
100%N Control	57.4±7.6 c	59.4±6.58 b
100%N SmartBlock	40.5±5.5 bc	51.67±5.16 ab
100%N DMN	30.8±5.7 a	53±4.30 ab

(ii) Panamera plant height was reduced at 1,4-DMN treatment compared to control at 100% N, possibly due to the delayed speed of emergence (EI).



(iii) 1,4-DMN improved NUE across all nitrogen levels, whereas SmartBlock® improved NUE only at the full nitrogen level in Panamera, suggesting a reliance on adequate fertilization.

CONCLUSION

The response of NUE and growth traits to the suppressants depended on N level and cultivar. 1,4-DMN increased NUE across all N levels, indicating suitability under low-input conditions. In contrast, SmartBlock® improved NUE only at the full N level, suggesting a reliance on adequate fertilization. Thus, 1,4-DMN is better suited to resource-limited systems, while SmartBlock® aligns with high-input production. Future studies should assess the genotypic responses of treated potatoes.

ACKNOWLEDGEMENT

Reference
Thoma, J. and Zheljazkov, V.D., 2022. https://doi.org/10.3390/su14116382
Mashishi, J.K., Motene, S.D., Berner, J. and Ngobese, N.Z., 2025. https://doi.org/10.1080/23311932.2025.2562175