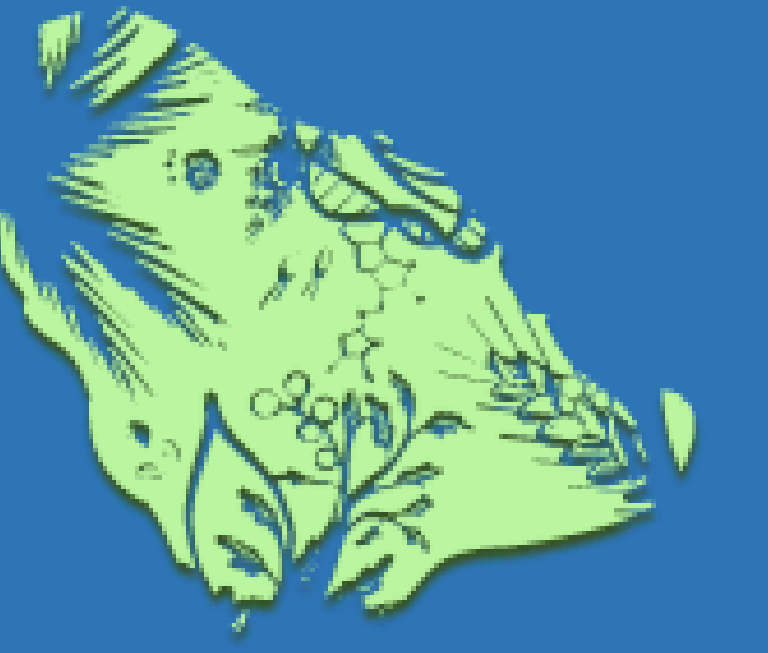


Designing specific seed germination inhibitors to combat *Striga* for tackling food security problem in Africa



Randa Zarban¹, Muhammad Jamil¹, Umar Hameed¹, Jian You Wang¹, Tadao Asami², Stefan Arold¹, and Salim Al-Babili^{1*}.

¹King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

²The University of Tokyo, Japan

*Correspondence: salim.babili@kaust.edu.sa

KAUST Workshop for Sustainable Food Security

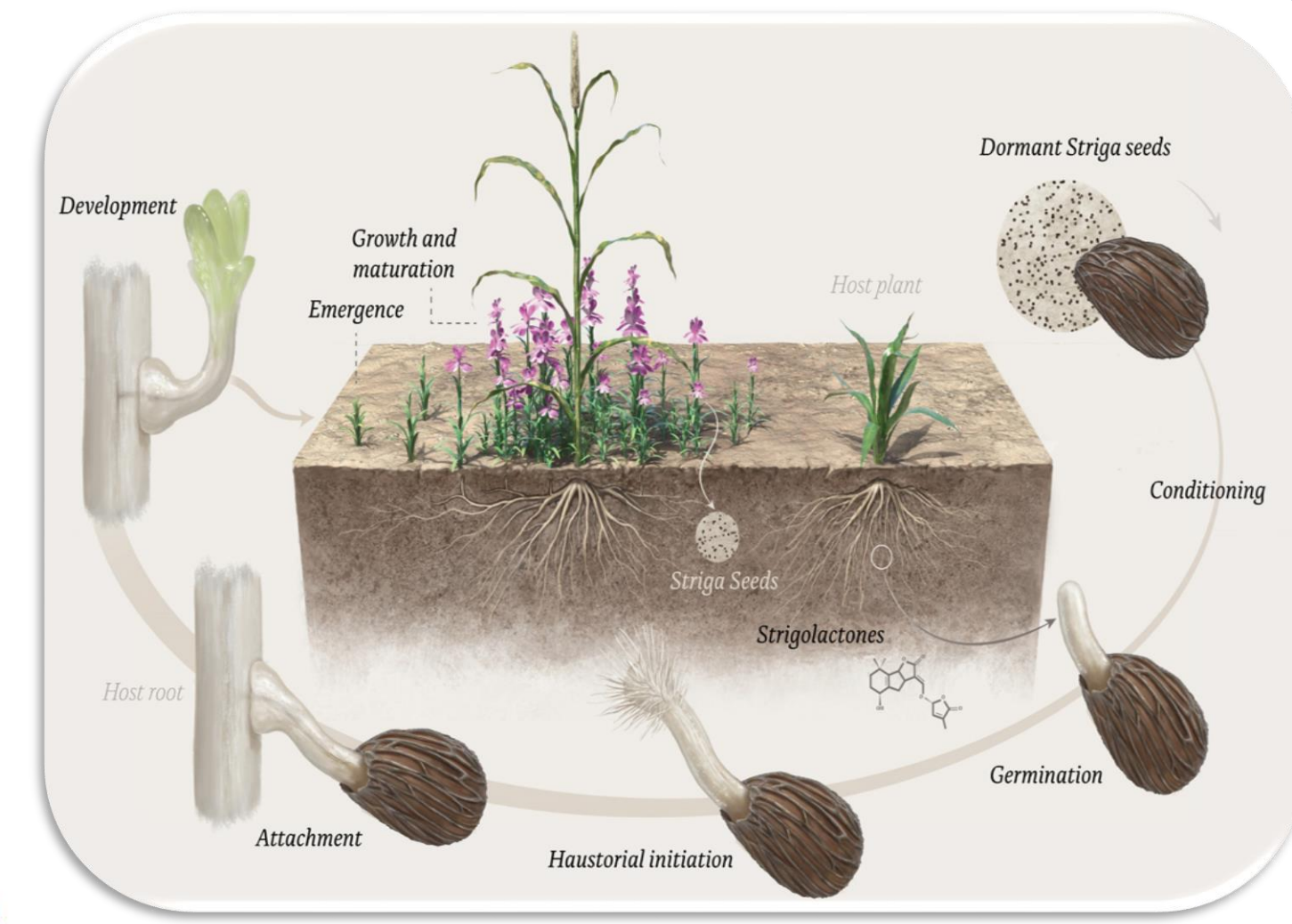
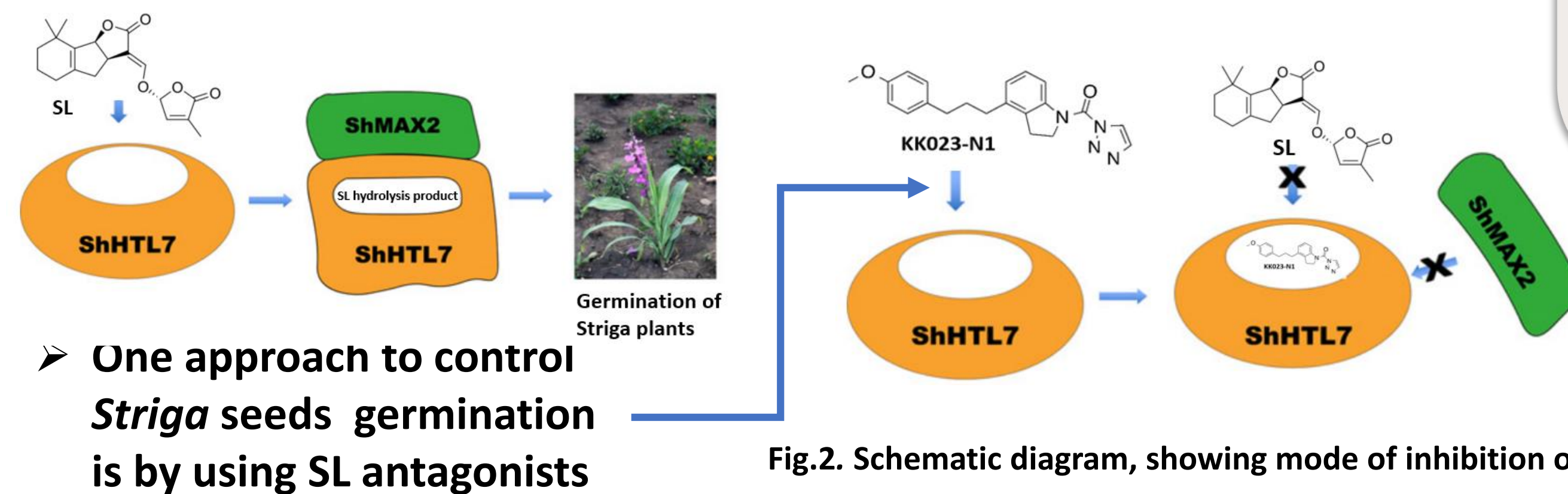
SUMMARY

- Striga* is a root parasite, attacking staple cereal crops with huge yield losses
- High production of long lived tiny *Striga* seeds, with complex life cycle has made *Striga* control very difficult.
- We have developed a very promising *Striga* specific inhibitor “KK023”.
- KK023 inhibit *Striga* seed germination by blocking ShHTL7 receptor.
- This compound will lead to the development of inhibitors to overcome *Striga* infestation, a threat to global food security.

BACKGROUND

Striga is a major threat to global food security (Jamil *et al.*, 2021):

- 60 -100% cereal yield loss.
- US \$7-10 billion annual loss.
- Affecting lives of > 300 million people in Africa.



METHODOLOGY

Synthesis of KK023:

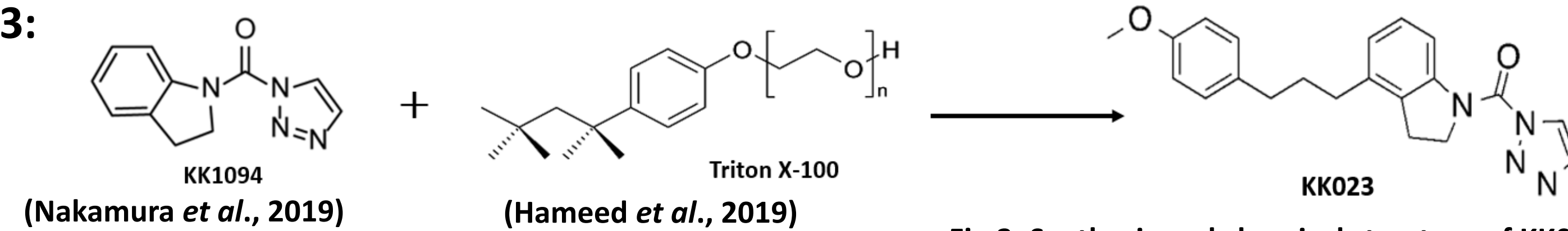


Fig.3. Synthesis and chemical structure of KK023 inhibitor

In vitro YLG hydrolysis assay and *In silico* modeling:

YLG hydrolysis by ShHTL7±KK023 was carried out in 96-well black plate and fluorescence was detected by SpectraMax i3 device. Modeling of ShHTL7 binding to KK023 was done using SwissDock server (Zarban *et al.*, 2021).

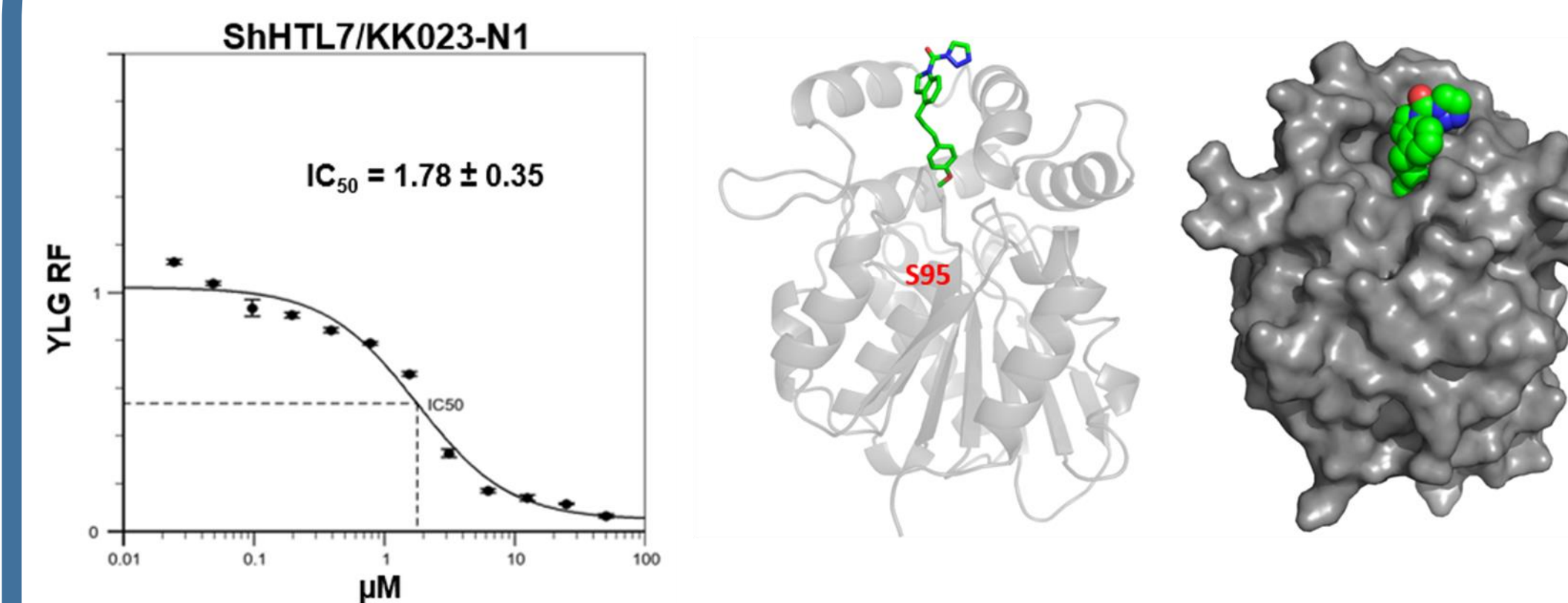
Striga and rice germination:

Germination of *Striga* seeds was evaluated in response to GR24±KK023, Triton X-100, or KK094. Rice seeds (cv Nipponbare), were grown hydroponically ± KK023, TritonX-100, or KK094 (Zarban *et al.*, 2021).

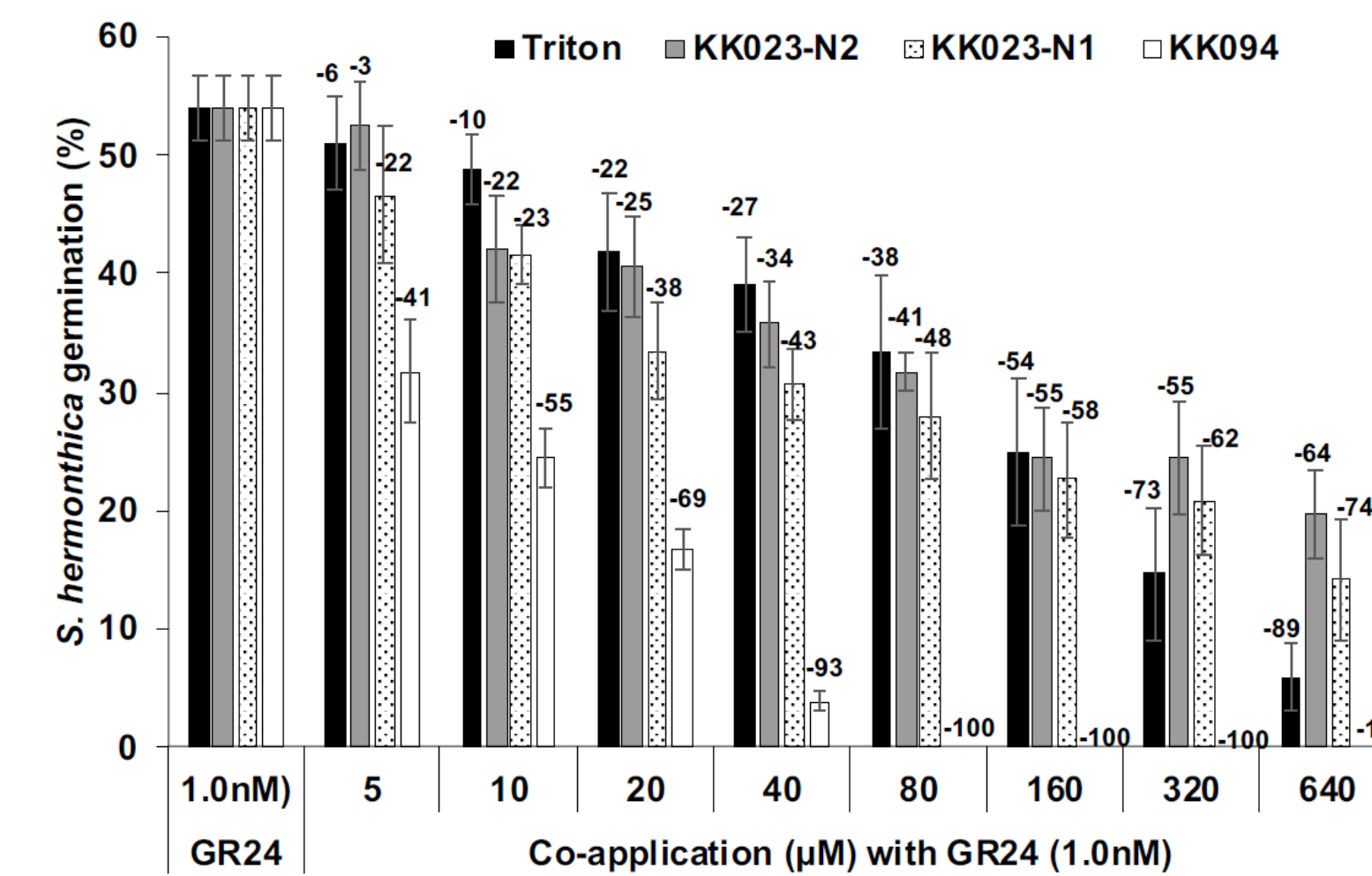
Striga emergence (greenhouse study):

Rice (cv IAC-165) plants were grown in *Striga* infested soil and were treated with 10 or 100 μM of KK023 or Triton X-100 for four weeks (twice a week) (Zarban *et al.*, 2021). *Striga* emergence in each pot was observed.

1. KK023 inhibited ShHTL7 mediated- YLG hydrolysis:

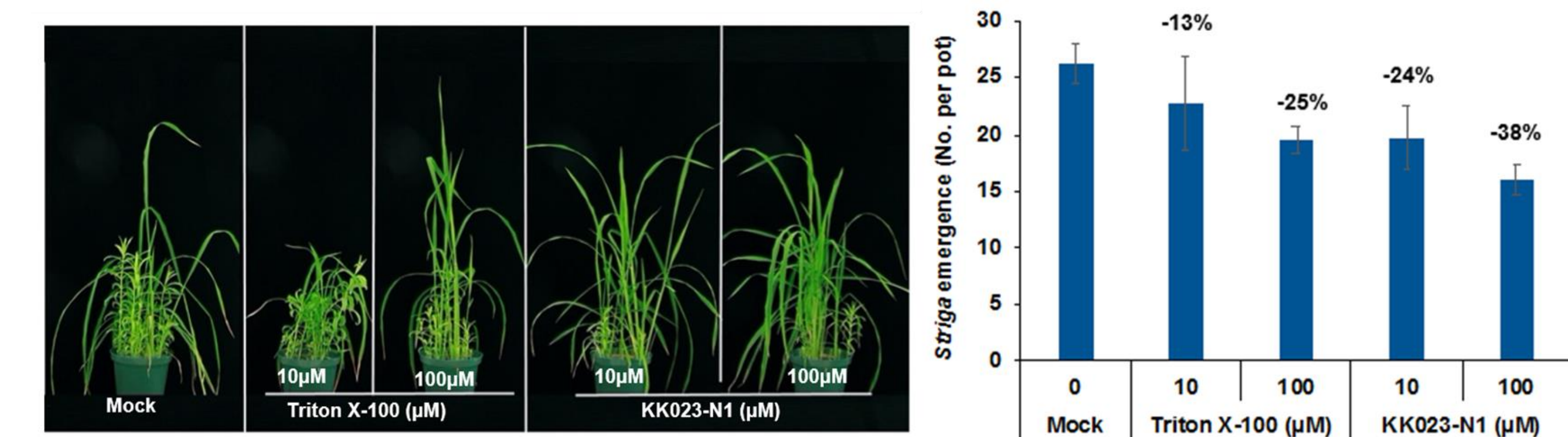


2. KK023 inhibited *Striga* seeds germination:

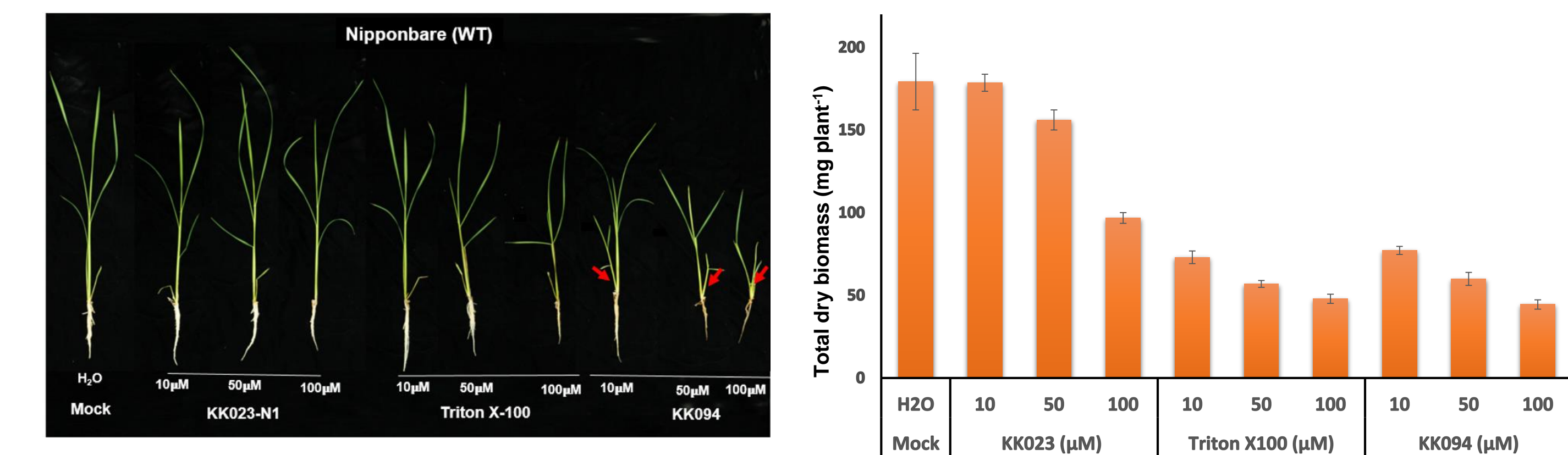


RESULTS

3. KK023 is a promising inhibitor to combat *Striga* infestation



4. KK023 is save and imposing no effect on host SL signaling or growth:



CONCLUSION

- KK023 inhibitors are novel chemicals which specifically bound to ShHTL7, reduced the *Striga* seeds germination and emergence of *Striga* plants, with less negative impact on host crop, unlike KK094 or Triton X-100.
- KK023 can be a promising herbicide to combat *Striga* seed germination and infestation for tackling global food security issues, specifically in sub-Saharan Africa.

Funding

This study has been financially supported by the Bill & Melinda Gates Foundation grant OPP1194472 and King Abdullah University of Science and Technology.

References

- Zarban *et al.*, 2021. Plant Physiology 188: 1369–1384.
- Jamil *et al.*, 2021. Plant Physiology 185: 1339–1352.
- Nakamura *et al.*, 2019. Molecular plant 12: 44-58.
- Hameed *et al.*, 2018. EMBO Report 19: e45619.

