

RNA Interference in Agriculture: Methods, Applications, and Governance **CAST Issue Paper 72; January 2024**

RNA interference (RNAi) is a naturally occurring gene silencing mechanism conserved across eukaryotes.

- The silencing of vital genes through RNAi has been explored for agricultural applications, including managing plant insect pests and pathogens, improving plant agronomic traits, and increasing consumer desirability of food.
- The RNAi mechanism interferes with the expression of proteins, creating alternate phenotypes.

RNAi offers a unique and specific tool as an alternative to synthetic pesticides.

- It is possible to design species-selective and efficient dsRNA molecules with negligible off-target effects within the species or impact on other organisms. These features present environmental advantages over synthetic pesticides, which are generally broadly active against targeted and non-target species.
- Currently, pesticidal dsRNA molecules can be delivered to targeted organisms using two approaches: (1) by production in genetically modified plants or (2) by topical application (e.g., spray) of formulated products.

In the United States, the Coordinated Framework for Regulation of Biotechnology, drafted in 1986 and updated in 2017 describes the roles and responsibilities of the EPA, FDA, and USDA concerning biotechnology oversight.

- The EPA regulates the sale, distribution, and use of all pesticides including those produced through genetic engineering and evaluates risks to humans and the environment.
- The FDA's regulatory role relating to genetically modified products is to offer a voluntary food safety consultation process to help ensure the resulting food and/or feed is safe for human/animal consumption.
- The USDA regulates genetically modified plants with an RNAi trait under the Plant Protection Act if it determines that the plant poses a plant health risk compared to conventional plants.

RNAi is an emerging pesticidal technology that will positively impact sustainable agriculture by providing high species specificity and may potentially lessen dependence on conventional pesticides with broader toxicity; however, many challenges remain.

- Barriers to dsRNA cellular entry can vary drastically among species, necessitating significant research into each pest species of concern.
- Sprayable dsRNA and in plant pesticidal products face practical challenges related to production cost and development time.

Experts to Contact for More Information:

Ana Maria Vélez, avelezarango2@unl.edu; Kenneth Narva, knarva@greenlightbio.com

To view the complete text of this CAST Issue Paper, visit the CAST website (www.cast-science.org) and click on Publications. For more information about CAST, visit the website or contact CAST at 515-292-2125.

Ag quick CAST



To download copies *RNA Interference in Agriculture: Methods, Applications, and Governance*, scan the QR code or visit the CAST website (www.cast-science.org), click on Publications, and select Issue Papers.

ABOUT CAST

The Council for Agricultural Science and Technology (CAST) is a nonprofit organization with its membership composed of scientific and professional societies, companies, nonprofits, and individuals. Through its network of experts, CAST assembles, interprets, and communicates credible, balanced, science-based information to policymakers, the media, the private sector, and the public.

The primary work of CAST is the publication of papers highly regarded as a source of science-based information written and reviewed by volunteer scientists and subject experts from many disciplines. CAST is funded through membership dues, unrestricted financial gifts, and grants.

Upcoming CAST Publications/Events

- *Preventing the Next Plant Invasion: Opportunities and Challenges* (February 2024)
- *Applications, Benefits, and Barriers of Gene Edited Crops* (March 2023)
- *FIFRA, ESA, and Pesticide Consultation: Understanding and Addressing the Complexities* (April 2023)