

ABAzyne Bioscience Inc.

An Introduction to the Company and its Technologies



Vision

ABAzyne will develop novel synthetic plant growth regulators (PGRs) that act on plants' endogenous ABA hormone pathways to improve plant productivity and producers' profits



Mission

Through strategic partnerships ABAzyne will deliver leading PGR technology to the global agriculture and horticulture markets.

ABAzyne Management



Jerome Konecni CEO

Jerome is an award-winning innovator and experienced executive. He has been a member of teams that have received national awards in innovation and science. As a Director General at the National Research Council, he was a member of a team that was awarded the National Public Service Award of Excellence for contribution in science - the first 100% bio-jet fuel flight in the world. As Vice President at Bioriginal Food & Science, he was the manager of the team that received the National Research Council's Innovative Product Award. The team accomplished four world firsts in lipid biosynthesis. He has held a variety of executive positions in public research organizations, executive government, private sector companies and NGO's. These include: President and CEO of Innovation Saskatchewan; Director General of NRC's Plant Biotechnology Institute (PBI), President and CEO of Genome Prairie; Vice President Corporate Development of Bioriginal Food & Science Corporation; and Vice President Agricultural Biotechnology, Small Industry and Corporate Services at the Saskatchewan Research Council. His extensive network in the science and innovation is based on numerous international collaborations and service on the Boards of prominent science and technology organizations. He was awarded an Honorary Doctorate from Karunya University in India.



Sue Abrams CSO

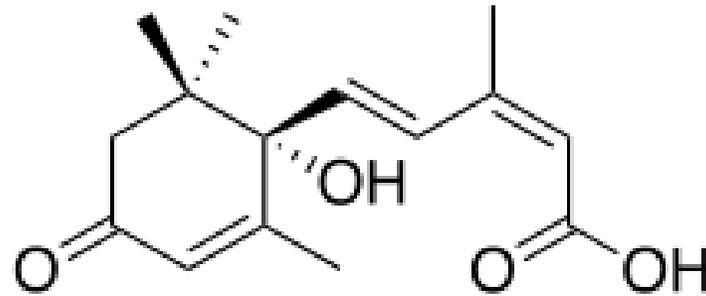
Sue has led a chemistry research program on the plant hormone ABA for more than 30 years, first at the National Research Council of Canada in Saskatoon and currently as Adjunct Professor in the Department of Chemistry at the University of Saskatchewan. She is an author on more than 180 refereed publications and inventor on 6 patents on ABA analogs. She has contributed to understanding the biology of plant hormone action in numerous collaborations, and developed an analytical method for analysis of multiple plant hormones that has found application in many research investigations worldwide. She was responsible for many years for the analytical labs at NRC Saskatoon, and from 2008-2012, took on positions as Research Director and acting Director General, managing plant biotechnology research programs and platform technologies at the Plant Biotechnology Institute.

Sue has a Ph.D. in Synthetic Organic Chemistry, Dalhousie University, Halifax, NS, and a B.Sc. Chemistry, Carleton University, Ottawa, ON.

ABAzyne Bioscience Inc.

- ▶ **ABAzyne** is an agriculture biotech company that develops leading patented synthetic analogs for plant growth regulation technology based on Abscisic Acid (ABA).
- ▶ Abscisic Acid is a plant signaling molecule that regulates diverse aspects of all plants' growth and development, tolerance and adaptation to environmental (or abiotic) stresses such as drought, heat, cold or excess salinity, and also biotic stresses.
- ▶ The hormone ABA acts at very low (micromolar) levels in the plant controlling:

- ▶ Germination of seeds
- ▶ Transpiration
- ▶ Growth
- ▶ Dormancy
- ▶ Ripening of fruit, with ethylene



ABAzyne's Products

- ▶ **Analogs that outlast Natural ABA - Hyper ABA (+)-8'-acetylene ABA**
 - ▶ Natural ABA plant treatments have limited efficacy and application due to enzymatic turnover.
 - ▶ ABAzyne's HyperABA, resistant to plant enzymes, has greater activity and persistence
- ▶ **Analogs that block ABA signalling - ABA-1019**
 - ▶ Elevated levels of natural ABA in plants can be deleterious for growth, with poor seed germination under cold or heat stress
 - ▶ ABA antagonist 1019 promotes germination under low temperature stress and can break dormancy in wild species.

Market Opportunities for Hyper ABA

- ▶ ABAyne's ability to produce the long-lasting ABA analogue, (+)-8'-acetylene ABA, which is resistant to plant enzymes that degrade the natural compound. This allows our product to be used where current natural ABA products are ineffective. Synthesis of (+)-8'-acetylene ABA is cost effective and industrially scalable.
- ▶ The main applications where the long-lasting ABA analogues have significant market value are as follows:
 - ▶ Antitranspirant - increase seedling survival during shipping, transplantation into fields and forests
 - ▶ Growth retardant for turf grass and other horticultural applications
 - ▶ Stress tolerance promoter under drought conditions or during seedling establishment
 - ▶ Reduce loss and increase survival under abiotic stress conditions, extending shelf life of bedding plants
 - ▶ Delay germination/extend dormancy
 - ▶ Prevent pre-harvest sprouting
 - ▶ Enable fall seeding by preventing premature germination
 - ▶ Controlling pollination timing for hybrid seed production
 - ▶ Enhanced production of seed storage products such as proteins and lipids during seed development
 - ▶ Enhanced production of stress induced secondary metabolites in plants and algae
 - ▶ Production of artificial seed for micropropagation
 - ▶ Research chemicals for identifying ABA-regulated genes involved in drought tolerance, seed development, germination etc.



Initial Market Targets- Hyper ABA

\Wine Grapes - Cold Tolerance, Climate change mitigation

- ▶ Using long-lasting ABA analogues to prevent damage from early spring frost. Wine grape growers experience significant losses from frosts early in the growth cycle,.
 - ▶ Researchers at Brock University in St. Catharines, Ont., found long-lasting ABA analogues sprayed on grape vines in the fall after harvest improved winter freeze tolerance 5 to 6°C and extended dormancy of buds in the spring by more than 2 weeks. Research trials in Ontario, Pennsylvania and Virginia

Control of Flowering Time

- ▶ A seed company has been conducting research for numerous years using long-lasting ABA analogues to delay germination in an early flowering parental line to synchronize flowering for hybrid seed production.

Global Floriculture and Ornamental Shelf Life Extension

- ▶ Testing ABA analogues to improve drought tolerance, delay in wilting/petal drop, and to extend shelf life in storage and shipping.
 - ▶ Researchers have shown positive results to date.
 - ▶ ABA analogues have shown to double pansy shelf life

Delaying bud break and maintaining cold hardiness in grape vines is a major issue for growers in Europe and North America



Frost Damaged Vineyards Auxerre France May 2017

ABA analog treatments applied in the Fall of 2008 delayed bud break of Cabernet Franc grapevines dramatically in 2009



8'-acetylene ABA treatment

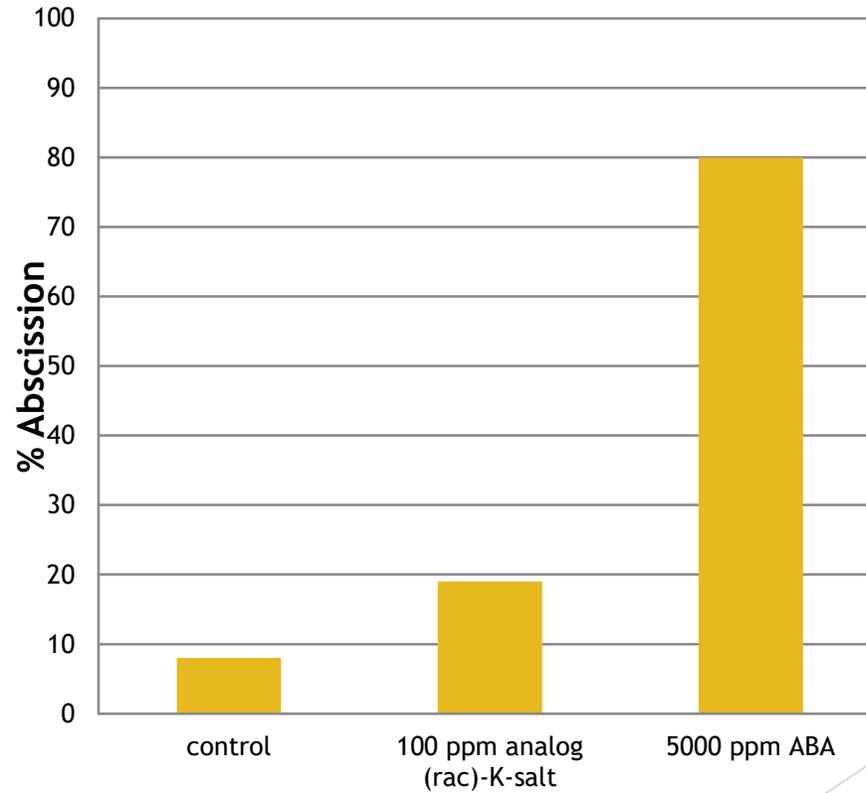
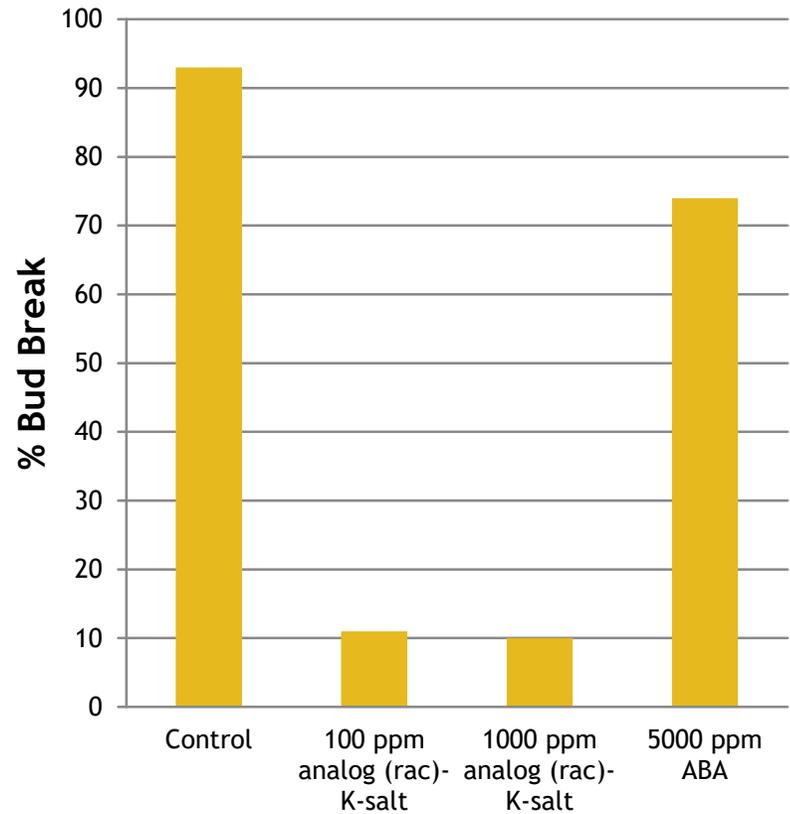


Control

Collaboration with Valent BioScience

8'-acetylene ABA significantly delays bud break of Merlot Grapes

50 X ABA causes leaf abscission, little delay in bud break



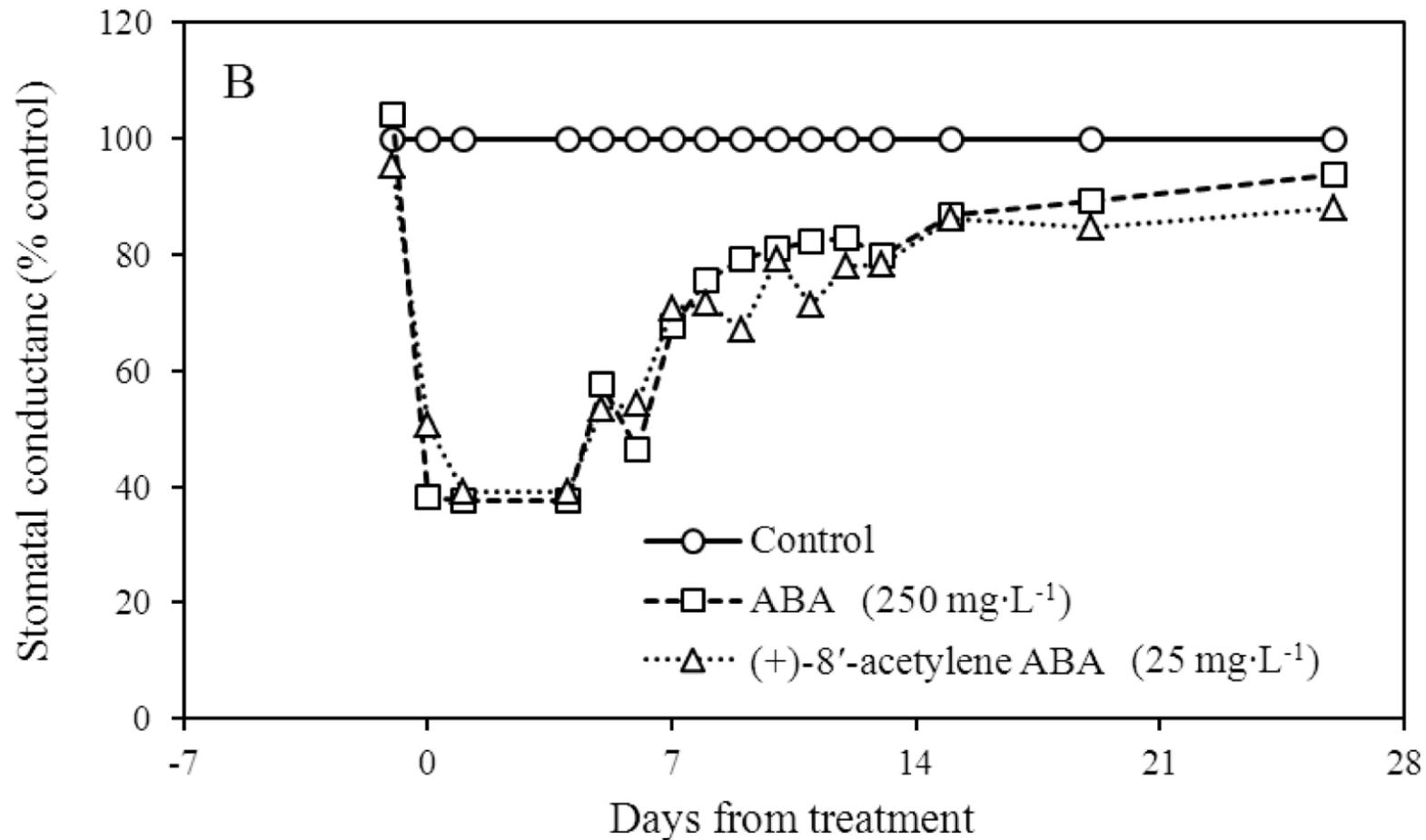
5 years Field trials

Bud break of Merlot grape vines delayed 16 days
with foliar fall-applied (+)-8'acetylene ABA
preventing damage from spring frosts

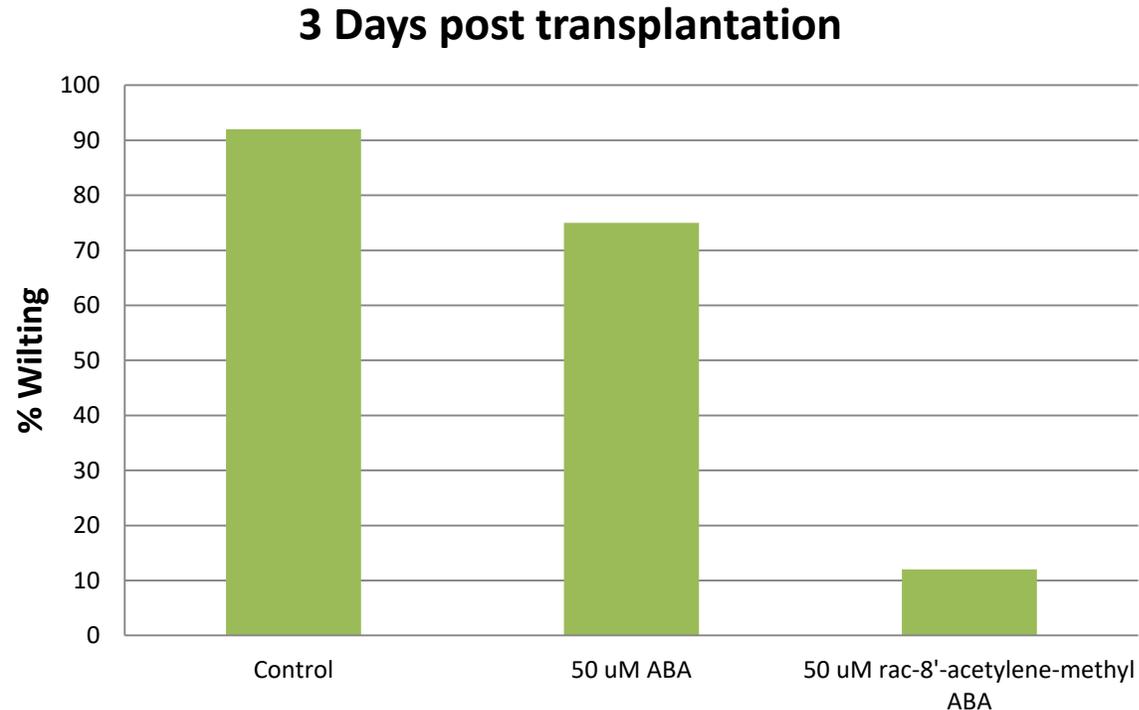


Growth in a Merlot grapevine sprayed with 0.5 g/L ABA-1017 (foreground)
and control grapevines (background). Creekshores, Ontario Canada. June 4th 2018.

8'-Acetylene ABA is 10x more effective than ABA in apple in regulating water loss in apple trees



Transplant Shock Reduction of Tomato Seedlings in the Field



Methyl ester of racemic 8'-acetylene ABA prevents wilting of transplanted seedlings
ABA is less effective

Initial Market Targets- ABA- 1019

ABA 1019 Germination Promotion with ABA Antagonist

- ▶ Using an ABA antagonist, a molecule that prevents the plant's natural ABA from slowing seed germination in colder than normal conditions, germination and seedling growth are enhanced. This active also facilitates a consistency in germination to improve productivity of crops grown in cold soils or environments.
 - ▶ ABAzyne's patented ABA antagonist 1019 is derived from readily available natural ABA in a two step synthesis process.

Germination Promotion with ABA Antagonist

- ▶ Faster germination and more uniform emergence is proven to provide
 - ▶ Higher disease resistance
 - ▶ Healthier root structure
 - ▶ Enhanced plant health
 - ▶ Better absorption rate
 - ▶ Improved turf density

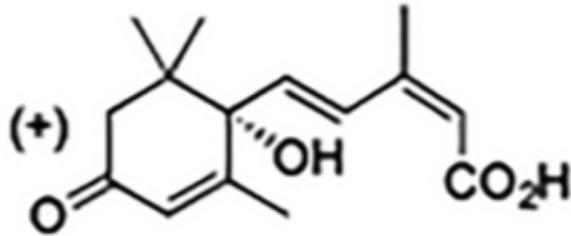


- ▶ Higher yields and increased profitability

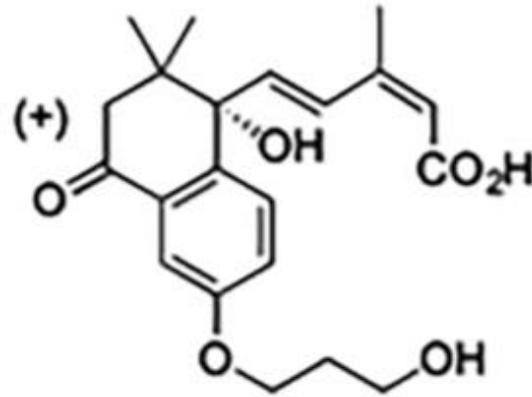
▶ Markets

- ▶ Seed Additives
- ▶ Broad Acre Crops
- ▶ Turf and Ornamental
- ▶ Fruits and Vegetable

Development of Potent Abscisic Acid Antagonists



Natural ABA



Tetralone ABA Antagonist

- Research on ABA antagonists is at an early stage, compared to agonist.
 - Antagonists have the potential to promote germination, promote growth, increase yield and protect against microbial infections.
- First generation antagonists overcome endogenous ABA inhibition of germination of lettuce seed (under high temperature), and reverse ABA closure of stomata Rajagopalan et al 2016 Biochem. 55 5155
- Second generation antagonists US patent was filed on Nov 2019, and are greater than 10X more active, and inexpensive to synthesize.

Biological Testing of Antagonist 1019

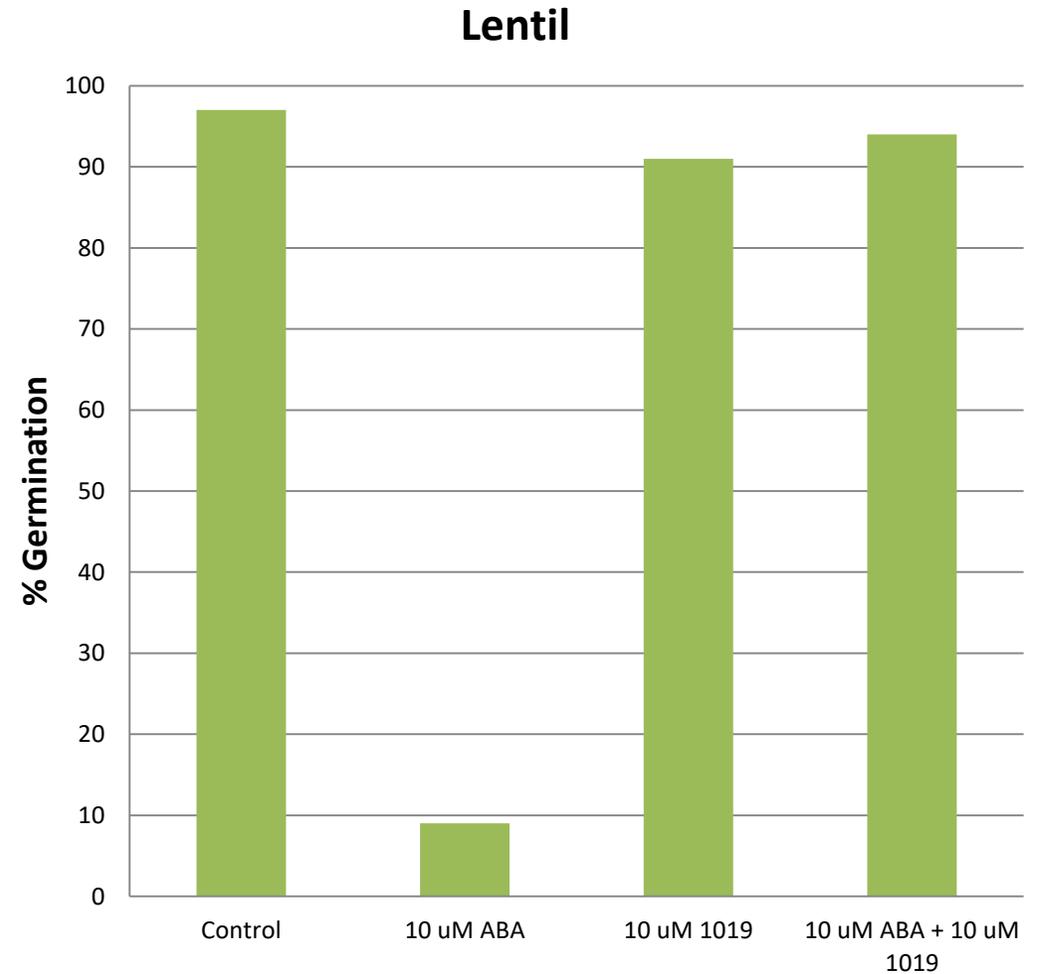
Overcomes ABA inhibition of germination/growth in: Lentil, Soybean, Canary seed, Rice, Sorghum, Barley, Canola

Breaks dormancy in wild Lentils, shortens generation time for breeders

Inhibits growth of the fungus *Botrytis cinerea* - potential antimicrobial

ABA Antagonist 1019 overcomes ABA-induced germination inhibition

- ▶ Lab Study Results, Day 2
- ▶ Antagonist promotes germination of seeds in lentil and soybean
- ▶ Testing of other species underway.



Antifungal activity of antagonist 1019

August 8, 2019



Arabidopsis plants were sprayed twice with Mock and chemical solution (ABA 1019, 100 micro M), and leaves were detached for inoculation. Inoculated leaves were incubated under light for 24 h before photographs were taken.

Future Pipeline Additions for ABA

▶ **ABA Antagonists**

- ▶ Germination Promotion under stress conditions
- ▶ Anti-microbial applications

▶ **ABA R&D Chemical custom synthesis**

- ▶ ABA metabolite standards
- ▶ ABA analogs

▶ **ABA Agonists**

- ▶ Antitranspirants
 - ▶ Bedding plant shelf life extension
 - ▶ Transplant shock reduction slide
 - ▶ Turf grass water use (future application)
- ▶ Stress Tolerance
 - ▶ Cold Hardiness and Bud break Delay in wine grapes
- ▶ Growth inhibitors
 - ▶ Germination inhibitors hybrid seed production (future application)
 - ▶ Fall seeding of spring crops (future application)
 - ▶ Plant height reduction (Greenhouse management e.g. cannabis)



Thank You