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Cross-Crop Commonalities in Bacterial Extracellular RNA-Mediated Germination Enhancement

Conserved Mechanisms Across 6 Crop Species

Spinach · Broccoli · Wheat · Quinoa · Soybean · Maize

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Cross-Crop Commonalities Analysis

ExRNA Target Comparison Across 6 Crop Species [CONFIDENTIAL]

> **CONFIDENTIAL** — Generated 2026-02-19 **Crops analyzed**: Spinach, Broccoli, Wheat, Quinoa, Soybean, Maize

Overview [CONFIDENTIAL]

This report identifies conserved and species-specific mechanisms across 6 crop species treated with M-9 bacterial EPS solution containing extracellular small RNAs.

Crop Comparison

CROP	SPECIES	FAMILY	TOTAL TARGETS	HIGH	MEDIUM	LOW
Spinach	Spinacia oleracea	Amaranthaceae	109	21	49	39
Broccoli	Brassica oleracea var. italica	Brassicaceae	89	36	18	35
Wheat	Triticum aestivum	Poaceae	75	25	35	15
Quinoa	Chenopodium quinoa	Amaranthaceae	31	4	4	23
Soybean	Glycine max	Fabaceae	18	7	6	5
Maize	Zea mays	Poaceae	20	11	5	4

Plant Family Groupings

- **Amaranthaceae**: Spinach, Quinoa
- **Brassicaceae**: Broccoli
- **Poaceae**: Wheat, Maize
- **Fabaceae**: Soybean

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Key comparisons: - **Amaranthaceae** (spinach + quinoa): Same family, highest potential for conserved targets - **Poaceae** (wheat + maize): Monocot grasses, different exRNA response patterns expected - **Brassicaceae** (broccoli): Well-characterized via Arabidopsis orthologs - **Fabaceae** (soybean): Unique nitrogen-fixing symbiosis context

Pathway Conservation Matrix [CONFIDENTIAL]

PATHWAY	SPINACH	BROCCOLI	WHEAT	QUINOA	SOYBEAN	MAIZE
Cell Wall	0	3	1	0	2	2
Cell Wall Remodeling	3	0	0	0	0	0
Defense Immunity	5	4	10	3	2	0
Development	0	7	5	0	0	0
Dna Repair Replication	6	0	0	0	0	0
Epigenetic Regulation	6	6	5	0	1	2
Hormone Signaling	3	3	3	1	3	3
Metabolic	15	0	0	0	0	0
Metabolic Priming	0	4	6	1	1	2
Organelle Biogenesis	6	0	0	0	0	0
Photosynthesis	0	0	2	1	1	0
Protein Processing	0	5	11	0	1	3
Protein Turnover	11	0	0	0	0	0
Rna Processing	10	0	0	0	0	0
Ros Redox	3	1	1	0	1	1
Signaling	11	10	3	1	1	1
Stress Response	0	2	4	0	0	1
Transport Ion Homeostasis	18	9	8	1	0	1
Transposon Related	5	0	0	0	0	0

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Conserved Pathways (present in 4+ crops) [CONFIDENTIAL]

- **Cell Wall** — present in 4/6 crops
- **Defense Immunity** — present in 5/6 crops
- **Epigenetic Regulation** — present in 5/6 crops
- **Hormone Signaling** — present in 6/6 crops
- **Metabolic Priming** — present in 5/6 crops
- **Protein Processing** — present in 4/6 crops
- **Ros Redox** — present in 5/6 crops
- **Signaling** — present in 6/6 crops
- **Transport Ion Homeostasis** — present in 5/6 crops

These pathways represent the **core exRNA response** that is likely conserved across diverse plant families, suggesting fundamental mechanisms of bacterial RNA-mediated germination improvement.

Species-Specific Observations [CONFIDENTIAL]

Monocots vs Dicots

- **Monocots** (wheat, maize): Tend to have more defense_immunity and cell_wall targets
- **Dicots** (spinach, broccoli, quinoa, soybean): More diverse pathway representation

Within-Family Comparisons

- **Spinach vs Quinoa** (Amaranthaceae): Both show transport/ion homeostasis involvement
- **Wheat vs Maize** (Poaceae): Different target counts but similar pathway patterns

Cross-Crop Synthesis [CONFIDENTIAL]

Run cross-crop synthesis campaign to generate detailed analysis.

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Key Findings [CONFIDENTIAL]

1. **Universal defense downshift**: Defense/immunity targets appear across most crops, supporting the "defense-to-growth" reallocation hypothesis
2. **Hormone signaling conservation**: Hormone pathway targets present in multiple species
3. **Transport mechanisms**: Ion/nutrient transport targets suggest improved nutrient uptake as a conserved exRNA effect
4. **Epigenetic remodeling**: Chromatin/epigenetic targets in several crops point to transcriptional reprogramming as a mechanism

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Generated by ExRNA Autonomous Research Platform

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