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Brainstorming Session Results

Resources & Funding Summary

1. Developing collaborative efforts, both nationally and internationally, is critical
    - Key to formalizing such efforts is to create an international consortium
    - Within the consortium, subgroups should be developed that can function nationally or internationally
    - A focus on developing countries is productive for international cooperation

2. The scope of the consortium should be carefully crafted
    - Within the consortium, subgroups should be developed that can focus broadly (such as leafy green management) or more specifically (such as all lettuce types or all soilborne diseases of leafy greens)

3. For sustained funding, multiple questions should be addressed sequentially
    - A strategic, hierarchical plan is required, built upon challenges outlined in other Fusarium wilt of lettuce brainstorming modules
    - For US funding: USDA programs
        - Multi-state programs are favored
        - NSF programs need to address basic questions in pathogenesis
    - For EU funding: COST programs
      Horizona 20/20 programs
    - Grant writing needs to be aggressive - generally, less than 10% of grants get funded
    - Actively pursue funding from industry - enlist stakeholders & trade groups

4. Visibility of consortium efforts needs to be targeted and international
    - Funding of prominent Centers of Excellence
    - Speakers & special sessions at national and international meetings
        - Session on Fusarium wilt of lettuce at the ISPP 2018 in Boston, MA

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Containment and Regulation Summary

1. Marketplace will regulate
    - Self-regulation favored with consortium information/direction

2. Seed health improvement is supported as a critical need
    - Develop seed testing protocols and economic thresholds
    - Develop GAPs for seed production and BMPs for seed processing
    - Develop seed treatment methods

3. Soil health may play a key role in mitigation
    - Containment is best achieved through sanitation
    - Soil health is a recurrent theme - interest in biologicals for FW mitigation
    - Rotation in off-season may play critical role in managing soil populations
    - There is industry resistance to soil diagnostics to identify infested fields

4. GAPs and BMPs are continuously evolving and need to be emphasized with information distribution
    - Seed health
    - Soil health
    - Sanitation practices

5. Area-wide management plans are important because they have local support.
    - Level of exclusion: seed indexing and out-of-area equipment are items of concern
    - Methods of monitoring within each area management plan

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Brainstorming Session Results

Breeding/Resistance Summary

1. Highest priority - speed up development of resistant varieties
    - Screening germplasm, both native and commercial, is critical

2. Funding must be engaged in both public and private sectors
    - Sharing information is problematic for private effort
    - Training of breeders needs to be promoted at all levels

4. MAS (Marker Assisted Selection) is supported to focus efforts
    - Quantification of performance standardized
    - Evaluations must embrace diverse cultural environments as well as geographic and temporal environments

5. New breeding programs need to be established for each production area
    - Tropical vs temperate programs need to be invigorated

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Brainstorming Session Results

Cultural Practices Summary

1. Multi-Disciplinary Approach Needed
    - Need to understand biology of pathogen and all components of pathosystem
    - Biologicals, fungicides, soil health, crop management all need to be considered together

2. Need to understand differences between different production environments (e.g. desert vs tropical vs temperate).
    - Need to understand differences among microbial communities: supportive vs. antagonistic.
    - How do cover crops impact the suppressiveness of soil microbial communities?

3. Impact of environment on specific cultivars

4. How farming practices influence soil health
    - Soil health is a recurrent theme - chemical and biological properties; fertility
    - What constitutes “good” soil in regard to Fusarium wilt of lettuce?
    - Soil factors contribute to crop stress or lack thereof
    - Rotation is a key component to overall crop health including impact of fallowing

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Brainstorming Session Results

Product Development Summary

1. Information on biology and pathosystem is critical
    - Pathogen interactions in soil relative to other microbes
    - Impacts of farming practices, site-specific soils/climate

2. Things to pursue:
    - Fungicide – limited but… PROCHLOREZ (Octave™)
    - Biologicals – MOA understood, impractical in field
    - Fumigants – expensive; can they be made cost-effective?
      Chloropicrin, vapam need evaluation
    - SAR – e.g. Actigard
      PROBENAZOLE – promising in Japan experiments
    - Seed treatments – what do we treat with?
      ILEVO used against other pathogens
    - Application timing – at plant, sidedress, etc.?

3. Next steps:
    - Generate more information on biological interactions between promising product - cultivars
    - Start thinking about multi-disciplinary approaches to Fusarium wilt of lettuce - Pathosystem, soil health, crop management, varietal selections …
      Pursue varied funding opportunities
    - Product development based on above products/biological info – Industry/academic/grower collaboration is essential