WASHINGTON TURFGRASS SEED COMMISSION RESEARCH PROPOSAL FOR 2018

New Project Proposal (Yes/No): No **Proposed Duration** (1, 2, or 3 years): 1

Project Title: Integrated Disease Management of Ergot in Kentucky Bluegrass

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Year Initiated: 2018 **Terminating Year**: 2019

Total Project Request: Year 1 $26,000 Year 2 $ Year 3 $

Other Funding Sources Agency Name: Oregon Seed Council, Washington State Commission on Pesticide Registration, Columbia Basin Grass Seed Growers Association, Oregon Seed Council and Oregon Department of Agriculture Alternatives for Field Burning Research Financial Assistance Program, Union County Grower Association

Amount Requested/Awarded: $50,000

Notes:

Description: (*Less than 200 words, describing objectives and specific outcomes)*

Ergot can be a serious disease in Kentucky bluegrass and perennial ryegrass seed crops. Currently only two fungicide chemistries are labeled for ergot and can be applied multiple times in a season for ergot and other diseases. New fungicides would provide grass seed growers with additional tools for ergot management and reduce the potential for fungicide resistance development. Since ergot only infects unfertilized flowers of grasses, practices that improve

pollination and fertilization can reduce the impact of ergot. Lodging during flowering restricts pollination and reduces fertilization of the crop; plant growth regulators could be used to reduce lodging and improve pollination. Regional predictive degree-day models were developed for the Columbia Basin, central Oregon, and northeast Oregon; the inclusion of additional data and variables will improve their predictive ability. This project will: 1) evaluate new fungicide chemistries to reduce ergot under field conditions; 2) determine the effect of plant growth regulators on anthesis timing, duration, lodging, and ergot; and 3) refine and test regional predictive models for ergot and deliver disease forecasts to growers via the Ergot Alert Newsletter. This project builds upon existing collaborative research aimed at developing a regional, IPM approach to managing ergot in PNW grass seed crops.

Justification and Background: (*400 words maximum)*

Ergot is an important seed replacement disease of Kentucky bluegrass and perennial ryegrass in Washington and Oregon. The ergot fungus (*Claviceps purpurea*) infects unfertilized flowers of grasses and transforms ovaries into dormant resting structures (sclerotia), which overwinter and produce spores the following season. The disease reduces yield and can be difficult to manage. Additional losses are incurred during seed cleaning to remove ergot.

Only two fungicide chemistries are currently labeled for ergot in grass grown for seed and, in many cases, multiple fungicide applications do not reduce ergot to acceptable levels. Repeated applications of fungicides with similar modes of action may increase the potential for fungicide resistance development in *Claviceps* populations. Additionally, the same or similar fungicides may be used for powdery mildew and/or rust in grass seed crops, further increasing the potential for fungicide resistance development in fungal pathogens. A need currently exists for new active ingredients due to the limited fungicide options that are currently available for ergot management. Moreover, the rotation of fungicide chemistries or use of fungicides with multiple modes of action could delay the development of fungicide resistance in fungal pathogen populations. Several modern generation succinate dehydrogenase inhibitors (SDHIs) belonging to FRAC group 7 have recently been released, offering a potentially new fungicide mode of action to be available for the control of fungal pathogens in grass seed crops.

The timing and duration of spore production by *Claviceps* can vary from year-to-year and among regions. Since the fungus can only infect unfertilized ovaries of grasses, cultivars with long anthesis periods can be particularly susceptible to ergot. Lodging during flowering can also restrict pollination and reduce fertilization of the crop. Cultural practices, such as the use of plant growth regulators, can potentially be used to alter the timing, duration, and/or efficiency of pollination and reduce ergot.

Predictive models are useful for ergot management because proper timing of fungicide applications can improve chemical control. A degree-day model that predicts ergot spore presence in the Columbia Basin was developed using lab and field data (1). Additional models for central and northeast Oregon were also recently developed. Data collected from several locations strongly suggest that soil moisture is another important factor in ergot spore production, but additional data are needed to incorporate this variable into existing models. Field validation of these models is also required to determine if they can be used to inform fungicide application decisions in real-time.

Methodology: (*400 words maximum)*

Objective 1: Screening novel fungicide chemistries for the ergot control during anthesis.

Fungicides not currently registered for ergot but with label potential will be tested in first-year field plots of Kentucky bluegrass (Madras, OR) and perennial ryegrass (Hermiston, OR).

Fungicides will be applied to artificially-infested field plots at anthesis at labeled rates and intervals and compared to a non-treated control and an industry standard (Quilt Xcel®). Ergot will be quantified after harvest. If present, data will also be collected pertaining to mildew and rust control.

Objective 2: Effect of plant growth regulators on anthesis and ergot. The effect of plant growth regulators on anthesis period, lodging, and ergot will be tested on early- and late-flowering varieties of Kentucky bluegrass. Replicated (4) plots of Kentucky bluegrass varieties 'Shamrock' (early flowering) and 'Everest' (late flowering) were established in Madras OR in August 2016. Replicated plots of 'Blue Ghost' were planted to evaluate the effect of Apogee on lodging. One half of each plot will be sprayed with the Apogee during the period after stem elongation has begun and before spikes or panicles emerge. Anthesis initiation and duration, lodging, and ergot incidence and severity will be recorded. Correlations between anthesis timing, lodging, and ergot will be determined.

Objective 3: Developing and testing predictive models for improved ergot control

a) *Regional model improvement and validation* Previous research resulted in a predictive degree-day model for ergot spore production in the Columbia Basin (CDD 414 to 725), central Oregon (CDD 254 to 554), and northeastern OR (CDD 196 to 439). From April to July, spore traps will be placed in Kentucky bluegrass fields in the Columbia Basin of Washington, central Oregon, and northeast Oregon. Traps will also be placed in perennial ryegrass fields in the Columbia Basin. Weather data will be recorded as in previous years and will be used to further improve and validate predictive models for each region.
b) *Evaluation of a model-based fungicide program for ergot.* Regional predictive degree-day models will be tested in replicated plots of perennial ryegrass in Hermiston, OR and Kentucky bluegrass in Madras, OR. Artificially infested plots will be subjected to one of three fungicide spray programs: predictive degree-day model program; a calendar-based program following the average degree-day period from 2000-2017, and a scouting-based program based flowering onset as observed in the field. Non-treated control plots will be included. The incidence and severity of ergot will be determined at harvest.

Anticipated Benefits and Information Transfer: (*100 words maximum)*

Fungicide evaluations will provide data for new fungicide labels for grass seed crops. Reduced lodging and improved pollination through the use of plant growth regulators can provide more sustainable disease control with fewer regulatory and safety concerns. Integrating additional data and variables into the predictive model should increase model accuracy and robustness. Combining the predictive model with electronic outreach will result in more informed, risk-based management decisions (e.g. improved timing of fungicide applications). Together, the three regional Ergot Alert Newsletters reach over 400 growers and stakeholders (2). The researchers regularly present their research at meetings, farm fairs, and field days.

References:

1. Dung, J.K.S., Alderman, S.C., Kaur, N., Walenta, D.L., Frost, K.E., and Hamm, P.B. 2017. Identification of weather factors related to *Claviceps purpurea* ascospore production and development and validation of predictive environmental favorability index models. Plant Disease 101(6):895-906.
2. Walenta, D.L., Kaur, N., Alderman, S.C., Frost, K.E., Hamm, P.B., and Dung, J.K.S. 2015. Using information technology to advance integrated ergot disease management in perennial

grass seed cropping systems. Pages 35-38 in: 2015 Seed Production Research at Oregon State University USDA-ARS Cooperating. N. Anderson, A. Hulting, D. Walenta, M. Flowers, and C. Sullivan, eds. Oregon State University, Ext/CrS 152.

Budget: *(Indirect or overhead costs are not allowed unless specifically authorized by the Board)*

Budget Item	2017	2018	2019
Salaries[1]		*$14,700*	*$*
Time-Slip		*$1,000*	*$*
Operations (goods & services)		*$1,000*	*$*
Travel[2]		*$1,000*	*$*
Meetings		*$0*	*$*
Other		*$400*	*$*
Equipment[3]		*$0*	*$*
Benefits[4]		*$7,900*	*$*
Total		***$26,000***	***$***

Budget Justification:

1 Funds are requested to partially fund (20%) a Research Associate (Post-doc) to work on the project (1.0 FTE)

2 Funds are requested to travel between research sites in Central Oregon and the Columbia Basin (spore traps, sample collections, disease assessments)

3 None requested

4 Funds are requested to pay for benefits for a Research Associate (Post-doc) (54% OPE)