Low-Maintenance Grasses to Include in Vegetative Buffers and Water Reclamation Systems in Nurseries

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Background

Vegetative buffers are used in nursery systems to catch and filter runoff before it either enters waterways or is recycled. Recycling runoff is a sustainable way to offset the cost of watering containerized nursery stock, but the runoff from production fields and greenhouses contain impurities like salts, sediment, and pesticides that need to be filtered out before reuse. Filtering operational water before entering public waterways or reuse for irrigation has been proven to reduce the level of contaminants and their negative impacts on both agriculture production and the surrounding environment (Jurries, 2003). Plants included in a vegetation buffer must also be able to tolerate poor water quality and be low-maintenance.

At Blue Moon Farm LLC, we have been developing different turf-type grass species for adaptation to stress tolerance and plan to test the efficacy of improved cultivars for filtering runoff. Species that we are interested in testing include tall fescue (*Festuca arundinaceae*), slender creeping fescue (*Festuca rubra* var. *litoralis*), and alkali grass (*Puccinellia maritima*). Other research has shown that vegetative buffers including tall fescue effectively reduce the amount of sediment-bound glyphosate and atrazine in runoff (Lin et al., 2011). All the species listed above have some natural tolerance to high salinity soils, but most cultivated varieties for use as turf were developed for higher yields and appearance. Our improved cultivars were developed through negative selection for salt and drought tolerance as well as yield and appearance but have not been tested for their ability to filter water contaminants.

Justification: Fertilizers, pesticides, and fungicides are commonly used by producers to stimulate healthy growth of biomass. These practices can contribute to agrichemical pollutant runoff. Enhanced cultivar selection for vegetative buffers and recapture systems have significant potential to be an affordable, effective tool for nurseries and commercial greenhouses in Oregon to incorporate into their existing water management practices.

Project Objectives: To test the functionality of improved cultivars of tall fescue, slender creeping fescue, and alkali grass for filtering sediment, salts, and the herbicide Tenacity™ from irrigation runoff. Results from the greenhouse experiment will be used to guide the selection of turf grass cultivars to include in vegetative buffers and presented to the agricultural community.

Methods

We plan to test the effectiveness of experimental varieties of tall fescue, slender creeping fescue, and alkali grass against a standard variety of tall fescue, ‘Kentucky 31’, for filtering ions and herbicide using a two-way factorial design with 4 replicates. 1-Liter plastic bottles cut length-wise and filled with untreated field soil (Malabon silty-clay loam) will be seeded with the test cultivars. All reps will receive regular water and fertilizer until the seedlings are well-established. After establishment, watering will be reduced to twice per week for 8 weeks, and each group of replicates will receive one of three watering treatments. The control group will only receive 100 mL fertilizer and water, one group will be treated with 100mL fertilizer plus a salt solution with an electrical conductivity of 6 dS/m, and one group will receive 100mL fertilizer plus salt solution and 1.5µL of Tenacity^{TM}.

The effluent from each bottle will be collected once per week and data recorded on water clarity (visual ranking system) and electrical conductivity (using an Oakton Con 6 hand-held meter). The collected water will then be applied to bentgrass seed in petri dishes lined with filter paper to test for presence of Tenacity^{TM} in the effluent. The germination rate of test groups will be compared against a calibration curve of germination rate of bentgrass at incremental Tenacity^{TM} concentrations. Controls using water-treatment solutions will be included in the germination test.

Timeline

Jan. 2021	Mar. 2021	May 2021	Sept. 2021	Feb. 2022
Establish bottle-plots in the greenhouse	Begin watering treatment and data collection	Finish watering treatments, Begin data analysis	Interim report, Repeat experiment to verify results	Poster presentation (OSU Small Farms Conference/ Associated Event)

Budget

Item	**Expected Cost**
Sodium chloride	$15
Tenacity herbicide	$65
Fertilizer	$35
Micropipette and tips	$250
EC standard solution (12,880µS/cm)	$50
1L plastic bottles (x48)	$50
Petri dishes	$55
Filter paper	$20
Labor (Lab Technician, $14/hour)	$3360
Conference poster presentation (OSU Small Farms Conference/Associated Event – printing and admission)	$100
Total	**$4,000**

References:

Jurries, D. (2003). Biofilters (Bioswales, Vegetative Buffers, & Constructed Wetlands) for Storm Water Discharge Pollution Removal. Oregon Department of Environmental Quality, p 1-56.

Lin, C.-H., Lerch, R. N., Goyne, K. W., & Garrett, H. E. (2011). Reducing Herbicides and Veterinary Antibiotics Losses from Agroecosystems Using Vegetative Buffers. *Journal of Environmental Quality*, *40*(3), 791–799.