**Fall Applications of Nitrogen and Potassium and their Effect
on Winter Hardiness on Annual Bluegrass**

**Progress Report to:**

**Canadian Turfgrass Research Foundation**

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## Objectives of this Study

The overall objectives are:

- To determine the effects of fall applied nitrogen and potassium on cold hardiness,
- To determine the relationship between plant cold hardiness, soil nutrient status, and plant tissue content,
- To determine if soil nutrient deficiencies or excesses have an impact on plant cold hardiness,
- To develop recommendations based on soil nutrient and plant tissue status with regard to fall fertilization in order to ensure maximum cold hardiness.

## Plot Establishment and Treatments List

This trial was established on a USGA specification putting green located at Olds College. This green was established in the summer and fall of 2012 with annual bluegrass seed cv. Two Putt. Baseline fertility levels were established in year one with the intent of having all nutrients in the sufficiency range at the commencement of the trial in mid-August. Soil extractable nutrient status and plant tissue testing were used to determine deficient, sufficient and excessive levels.

Table 1 - List of Treatments

| Treatments | Nutrient Source & Rate | |
|---|---|---|
| | Urea 46-0-0 | Potash Sulphate 0-0-52 |
| Nitrogen 0x Rate + Potash 0x Rate | 0.0 kg N/100m$^2$ | 0.0 kg K/100m$^2$ |
| Nitrogen 0x Rate + Potash ¼x Rate | 0.0 kg N/100m$^2$ | 0.125 kg K/100m$^2$ |
| Nitrogen 0x Rate + Potash ½x Rate | 0.0 kg N/100m$^2$ | 0.25 kg K/100m$^2$ |
| Nitrogen 0x Rate + Potash 1x Rate | 0.0 kg N/100m$^2$ | 0.5 kg K/100m$^2$ |
| Nitrogen ¼x Rate + Potash 0x Rate | 0.125 kg N/100m$^2$ | 0.0 kg K/100m$^2$ |
| Nitrogen ¼x Rate + Potash ¼x Rate | 0.125 kg N/100m$^2$ | 0.125 kg K/100m$^2$ |
| Nitrogen ¼x Rate + Potash ½x Rate | 0.125 kg N/100m$^2$ | 0.25 kg K/100m$^2$ |
| Nitrogen ¼x Rate + Potash 1x Rate | 0.125 kg N/100m$^2$ | 0.5 kg K/100m$^2$ |
| Nitrogen ½x Rate + Potash 0x Rate | 0.25 kg N/100m$^2$ | 0.0 kg K/100m$^2$ |
| Nitrogen ½x Rate + Potash ¼x Rate | 0.25 kg N/100m$^2$ | 0.125 kg K/100m$^2$ |
| Nitrogen ½x Rate + Potash ½x Rate | 0.25 kg N/100m$^2$ | 0.25 kg K/100m$^2$ |
| Nitrogen ½x Rate + Potash 1x Rate | 0.25 kg N/100m$^2$ | 0.5 kg K/100m$^2$ |
| Nitrogen 1x Rate + Potash 0x Rate | 0.5 kg N/100m$^2$ | 0.0 kg K/100m$^2$ |
| Nitrogen 1x Rate + Potash ¼x Rate | 0.5 kg N/100m$^2$ | 0.125 kg K/100m$^2$ |
| Nitrogen 1x Rate + Potash ½x Rate | 0.5 kg N/100m$^2$ | 0.25 kg K/100m$^2$ |
| Nitrogen 1x Rate + Potash 1x Rate | 0.5 kg N/100m$^2$ | 0.5 kg K/100m$^2$ |

**Research Initiated Since Last Report**
- Tissue samples were collected from each plot in early October and sent to Brookside Labs for analysis
- Soil samples were collected in the spring of 2014 and submitted to the lab for determination of sufficiency levels
- Representative tissue and soil samples were collected in July 2014 and sent to the lab for the determination of baseline levels for the initiation of the study in mid-August 2014
- A fertility program has been put in place to address any deficiencies in the soil nutrient status

**Progress to Date**
- Tissue samples were received back from the lab in January and all values were entered into a spreadsheet for further review
- Soil samples were received back from the lab in late June

**Results Since Last Report**
*Tissue analysis*
- Tissue analysis showed that phosphorus levels were generally low to sufficient and would require greater levels of nutrient application to bring all values into the sufficiency range
- Magnesium levels were also low to sufficient and would require nutrient applications to bring tissue values up to the sufficiency range for all samples
- Calcium and sulfur levels were in the sufficiency range
- Iron was in the excessive range for all 64 samples
- Manganese was excessive for about half of the samples
- Copper, zinc and boron were generally in the sufficiency range
- Nitrogen showed an application rate response as tissue values were higher as the rate increased
- Potassium did not show an application rate response and actually showed that all samples were still deficient despite what was thought to be excessive applications

*Soil analysis*
- Soil analysis showed that phosphorus levels were either sufficient or deficient, depending on the extraction method!
- Magnesium levels generally showed that there was an excessive amount present in the soil
- Sulfur levels were low in the soil
- Calcium and magnesium were excessive in the soil analysis
- Iron was in the sufficient range for all samples
- Boron, copper and zinc were low but were considered sufficient in the tissue analysis
- Nitrogen levels in the soil were estimated but a treatment difference was not specifically noted
- Potassium levels were either low or low/sufficient which would indicate that greater levels of potassium need to be applied prior to the initiation of the study in year two