Graph 6 is the second year (2012) data from the Arlington trial. This year was the driest year on record since 1945 in Wisconsin and not indicative for the annual production of the various grasses. But even under these extreme circumstances, the festuloliums came through remarkably well.

**Use of Festuloliums:**
Because of their broad genetic diversity, festuloliums can be adapted to growing conditions as far south as the transition zone and as far north as Canada. They can be utilized in various forage production systems.

**New Pasture Seedings:**
Ryegrass-types can be used as a component in the mixture that establishes quickly, provides high forage quality, and persists multiple years. Ryegrass-types can also be used as a monoculture. On the other end of the spectrum, tall fescue-types can be a long lived component that provides high forage yield similar to tall fescue, but with a higher forage quality. Tall fescue-types improve summer performance.

**Overseeding / Grasshancing®**
Because of their establishment vigor, ryegrass-types can be used to strengthen thin pastures and hay fields. Ryegrass-types can be used to reinvigorate winter damaged alfalfa, improving both DM yield and fiber digestibility. The later maturity of the festuloliums allows cutting management beneficial to alfalfa.

**Companion Planting with Alfalfa:**
Ryegrass-types can be planted with alfalfa as a high quality nurse crop. Later maturing tall fescue-types can be planted with alfalfa to provide higher forage yields, increase total forage fiber digestibility, or to improve the persistence of the hay stand. The alfalfa-festulolium combination can produce >10% DM yield than alfalfa-timothy or alfalfa-meadow fescue combinations. (DLF trials in the UK)

**Emergency Feed:**
Festulolium can match the short term yield of annual grasses, provide longer growth into the summer, and then persist into the following crop years.

**Combinations:**
Festuloliums can be partnered effectively with many forage species including alfalfa, clovers, annual ryegrass, perennial ryegrass, orchardgrass, tall fescue, timothy, brome and others.

**Seeding Rate:**
- 25-35 lbs/acre pure stand
- 3-20 lbs/acre in a mixed stand

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Festulolium is the name for a hybrid forage grass developed by crossing meadow fescue (Festuca pratensis) or tall fescue (Festuca arundinacea) with perennial ryegrass (Lolium perenne) or Italian ryegrass (Lolium multiflorum). This enables combining the best properties of the two types of grass. The resulting hybrids have been classified as:

<table>
<thead>
<tr>
<th>Maternal Parent</th>
<th>Paternal Parent</th>
<th>Hybrid Progeny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Festuca arundinacea</td>
<td>Lolium multiflorum</td>
<td>Festulolium pabulare</td>
</tr>
<tr>
<td>Festuca arundinacea</td>
<td>Lolium perenne</td>
<td>Festulolium holmbergii</td>
</tr>
<tr>
<td>Festuca pratensis</td>
<td>Lolium multiflorum</td>
<td>Festulolium bracnii</td>
</tr>
<tr>
<td>Festuca pratensis</td>
<td>Lolium perenne</td>
<td>Festulolium liliaceum</td>
</tr>
</tbody>
</table>

The fescues contribute qualities such as high dry matter yield, resistance to cold, drought tolerance and persistence, while ryegrass is characterized by rapid establishment, good spring growth, good digestibility, sugar content and palatability. The individual festulolium varieties contain various combinations of these qualities, but all are substantially higher yielding than their parent lines. While festuloliums have been around for many years, the true potential had never been pursued in earnest. DLF has developed a substantial breeding program in hybrid festulolium that has produced a unique range of hybrid festulolium varieties. After initial hybridization and subsequent selection on the hybrid progeny or back crossing the hybrid progeny to its parental lines, a wide range of varieties with varying characteristics and phenotypes has been created. They are classified according to their degree of phenotypical similarity to the original parents, not to their genotype heritage. One can regard them as high yielding fescues with improved forage quality or as high yielding, more persistent ryegrasses.

This genotype make-up of festuloliums can be made visual. The chromosomes of festulolium can be isolated and then colored to show the parental origin of chromosome sections. It provides a very visual effect of the hybridization between the two species.

**Festulolium Diamond®**
Via a newly developed marker analysis, Diversity Array Technology (DArT), the actual percentage of parental DNA can be determined and the characteristics of a newly made hybrid can be fairly well predicted. This makes the selection process after initial hybridization more efficient and much shorter.
Use of Festuloliums

Varieties: Perun [Festulolium braunii], Perseus [Festulolium braunii], Hostyn [Festulolium braunii], Becva [Festulolium pabulare], Lofa [Festulolium pabulare].

Morphologically, these varieties resemble Italian ryegrass but with a persistence of up to four years. This type is suitable for both cutting and grazing. The object of the DLF breeding program is to retain the Italian ryegrass yield and quality combined with resistance to rust and xanthomonas plus winterhardiness and persistency from the festulolium.

In general, ryegrass-type festulolium can be characterized by:
- High seedling vigor, comparable to annual ryegrass
- Very early spring growth
- High yield
- Slightly lower energy concentration and sugar content than ryegrass
- Trendency for heading in regrowth
- Upright growth
- Better persistence than their ryegrass parent lines
- Susceptible to winter kill in absence of snow cover

Tall Fescue-Type

Varieties: Fojtan [Festulolium pabulare], Hykor [Festulolium pabulare], Mahulena [Festulolium pabulare], Felina [Festulolium pabulare].

Morphologically and in terms of cultivation, these types resemble tall fescue. They combine tolerance to frost, drought and heat and persistency of tall fescue with the better feed quality and rapid establishment of ryegrass. The result is a high quality “tall fescue” with excellent persistency. Trials at the DLF research station in the Czech Republic are ongoing already for the tall fescue-type festuloliums can be characterized by:
- High seedling vigor compared to tall fescue
- Earlier spring growth than tall fescue
- High yield
- High quality, close to that of ryegrass
- Tendency for heading only in 1st cut
- Very persistent
- Upright growth
- Tolerant drought and periodical flooding
- Good winterhardiness

Forage Yield

DLF festuloliums have a much higher yield than perennial ryegrass or fescues and start producing earlier in the season. Even in an annual ryegrass trial in Ohio, DLF festulolium variety Perun was the top yielding variety (Ohio State University, South Charleston, 2006). In a University of Wisconsin trial (Arlington 2011,2012), the DLF ryegrass-type festuloliums (Perun, Lofa, Perseus) outyielded all other grasses in the trial. (Graph 1 below)

In general, ryegrass-type festulolium can be characterized by:
- Good winter hardiness
- Tolerates drought and periodical flooding
- Upright growth
- Very persistent
- Tendency for heading only in 1st cut
- High quality, close to that of ryegrass
- High yield
- Earlier spring growth than tall fescue

Table 1 below gives the RFQ and RFV values for samples taken from the last cutting in fall 2012 of a Eucarpia trial planted in spring 2012 at the DLF Hladke Zivotice Research Station in Czech Republic. The NIR analysis of the samples was conducted at FFR Cooperative, Lafayette, IN.

Festulolium overall is slightly lower in RFQ and RFV than ryegrass, but there is an interesting exception with the tall fescue-type festulolium Fojtan. Tall fescue Kora is a high quality type and not indicative for tall fescue in general. Quality trials in 2013 will refine these findings.

Graph 1: Forage Yield Comparison

Graph 2: Milk per Acre Analysis

Milk per Ton

From the NIR analysis data and the University of Wisconsin Alfalfa/Grass Evaluation System - Milk 2006, the Milk per Ton can be derived and compared to the standard high quality alfalfa, “Alfalfa 20,30,40”. Graph 2 below shows the Milk per Ton for each variety expressed as a percentage of the high quality alfalfa (Alfalfa 20,30,40 = 100%).

Graph 3: Milk per Acre Analysis

Graph 4: Seasonal production [tons/acre] of DLF festulolium compared to tall fescue in first production year.

Graph 5: Seasonal production of DLF Festulolium ryegrass type compared to Fojtan, a DLF Festulolium tall fescue-type, in first production year at DLF KY research station.