Effect of Cropping System on a Fungal Community Colonizing Seeds of Fodder Galega (Galega orientalis Lam.)

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Abstract

The fungal population colonizing the seeds of fodder galega cultivated in pure stand was greater than that cultivated in mixed stand. No significant differences were observed in the species composition of the obtained fungal colonies. In all analyzed combinations, Alternaria alternata was predominantly isolated from the seeds. Other saprophytic fungi were represented by the following species: Epicoccum purpurascens, Cladosporium cladosporioides as well as fungi representing genera Mucorales: Mucor hiemalis and Rhizopus nigricans. Among the pathogens, Botrytis cinerea was most often isolated. The mineral and SNA medium as well as the process of superficial disinfecting of seeds reduced the number of isolated fungi.

Keywords: fodder galega (Galega orientalis Lam.); pure sowing; mixed sowing; seeds; fungi

INTRODUCTION

Fodder galega (Galega orientalis Lam.) is a perennial papilionaceous plant containing large protein concentrations in both the vegetative parts and in the seeds. Next to soil, these seeds are an important source of pathogens representing Fusarium and Botrytis cinerea and Sclerotinia sclerotiorum (Filipowicz 1989; Nowicki 1995). A better understanding of the fungal species colonizing the seeds will help control them and improve plant health.

Cwalina-Ambroziak and Majchrzak (2000) reports that in laboratory experiments with the seeds of fodder galega cultivated without fertilization, species representing Fusarium and Botrytis cinerea were isolated more frequently than from the seeds originating from the combination with fertilization.

The aim of the experiment was to determine the fungal community colonizing the seeds of fodder galega cultivated in pure and mixed sowing with smooth brome-grass.

MATERIALS AND METHODS

The experiment was carried out in 2000 and 2001 on an experimental field in Knopin. The experimental material were randomly selected mature seeds of fodder galega cultivated in pure and mixed sowing with smooth brome-grass (15–20 kg + 10 kg/ha, in the number of 600 seeds from each combination. The seeds used in the analysis were disinfected (30 s in 50% ethyl alcohol and 0.01% sublimate, followed by 3 rinsings in sterile water) and not disinfected (3 rinsings in sterile water). Three types of media were used: glucose – potato (PDA), SNA (Nirenberg 1981) and mineral (Lacicowa 1970). After a 7-day incubation at 22°C the resulting fungi were transferred onto agar-agar slants for further identification.

RESULTS

The laboratory analyses of the fodder galega seeds resulted in the isolation of 976 fungal colonies (Table 1) represented by 12 species, yeast-like fungi and non-sporous fungi. The species of Alternaria alternata was dominant and constituted 64.7% of the total colony. The remaining saprophytic fungi included: Epicoccum purpurascens (6.6%), Cladosporium cladosporioides (2.7%) and Penicillium spp. and Rhizopus nigricans 1.2% each. The percentage of pathogens in the total fungal population was smaller and Botrytis cinerea (19.0%) was the most frequently isolated species. Rare
fungi from *Fusarium* genera (1.5%) were represented by *F. avenaceum*, *F. culmorum*, *F. oxysporum* and *F. poae*.

The results showed that there are no significant differences in fungal species composition in the seeds from particular combinations. However, the experimental factors such as crop type, medium, seed disinfecting method had an effect on the number of isolated fungi. The seeds of fodder galega cultivated in pure sowing produced 11% isolates more than the seeds of fodder galega cultivated in mixed sowing (Figure 1A). The following species were isolated more frequently: *Alternaria alternata*, *Botrytis cinerea* and fungi representing *Fusarium* (Figure 2).

The fungal population was also modified by the type of medium. The smallest number of fungi was isolated on the SNA and the mineral media, which were deficient in nutrients. The SNA medium enabled the isolation of a fungal colony representing *Fusarium*. The most favorable medium for fungal

### Table 1. Fungi isolated from seeds of fodder galega in investigated period

<table>
<thead>
<tr>
<th>Fungi</th>
<th>Fodder galega</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Fodder galega with smooth brome-grass</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PDA</td>
<td>SNA</td>
<td>m.m.</td>
<td>PDA</td>
<td>SNA</td>
<td>m.m.</td>
<td>PDA</td>
<td>SNA</td>
<td>m.m.</td>
<td>PDA</td>
</tr>
<tr>
<td><em>Alternaria alternata</em> (Fr.) Keissler</td>
<td>61</td>
<td>40</td>
<td>54</td>
<td>89</td>
<td>64</td>
<td>44</td>
<td>352</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Botrytis cinerea</em> Pers.</td>
<td>18</td>
<td>14</td>
<td>15</td>
<td>30</td>
<td>21</td>
<td>17</td>
<td>115</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cladosporium cladosporioides</em> Fres</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Epicoccum purpurascens</em> Ehrenberg</td>
<td>11</td>
<td>2</td>
<td>13</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>27</td>
<td>38</td>
</tr>
<tr>
<td><em>Fusarium</em> spp.</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>9</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><em>Mucor hiemalis</em> Wehmer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Paecilomyces lilacinus</em> (Thom) Samson</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><em>Penicillium</em> spp.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><em>Rhizopus nigricans</em> Ehrenberg</td>
<td>2</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Yeast – like fungi</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Non sporulating fungi</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>98</td>
<td>57</td>
<td>74</td>
<td>136</td>
<td>106</td>
<td>71</td>
<td>542</td>
<td>70</td>
<td>37</td>
<td>53</td>
</tr>
</tbody>
</table>

m.m. = mineral medium

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![Figure 1. Fungi isolated from seeds of Galega orientalis Lam.](image-url)
development was the PDA, which is commonly used for phytopathological experiments. The resulting fungal colonies constituted 42.2% of the total number of the isolated fungi. Seed disinfection decreased the number of isolated Alternaria alternata and Botrytis cinerea by 15% (Figures 1B, 1C).

**DISCUSSION**

As the result of the laboratory experiments with seeds of fodder galega, the following fungal species were isolated most frequently: Alternaria alternata, Botrytis cinerea, Epicoccum purpurascens, Cladosporium cladosporioides as well as fungi representing Fusarium. Scientific literature (SIMAY 1994; MARCINKOWSKA 1997) widely confirms the occurrence of the above pathogens were more frequently colonizing the seeds of fodder galega cultivated in pure sowing. According to Filipowicz (1989) and Nowicki (1995), these fungi are transferred together with the seeds, which are an important source of diseases evoked by these fungi. Fungi from the genera of Penicillium, Mucor and Rhizopus, which are common in nature, were scarcely represented in the experiment.

**References**


Figure 2. Percentage of fungi isolated from seeds of Galega orientalis Lam.