# OCCURRENCE AND TRENDS OF WEED SEED AND ERGOT CONTAMINANTS IN OREGON-GROWN *POA PRATENSIS* AND *POA TRIVIALIS* SEED LOTS

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**Introduction**

In 2013, we published a study in Seed Technology (vol. 35, pages 237–250) on assessing the frequency of occurrence of various weed species and ergot (sclerotia of *Claviceps purpurea*) in Kentucky bluegrass (*Poa pratensis*) and rough bluegrass (*Poa trivialis*) grown in Oregon during 1986–2012. Following are highlights of the findings of that study. A reprint of the original paper can be viewed at the OSU Seed Crops website (http://cropandsoil.oregonstate.edu/group/seed-crops).

**Materials and Methods**

Data for the frequency of occurrence of several weed species in Kentucky bluegrass (KBG) during 1986–1995 were obtained and compiled from a summary of weed seed occurrence in certified seed sample purity test records at the OSU Seed Lab (Dade, 1996). Data for 2002–2012 were obtained from the OSU Seed Lab purity testing records for certified seed lots of KBG and rough bluegrass (RBG).

**Results**

Kentucky bluegrass

Within the 21 years of the study, 155 different weed contaminants were identified in KBG, including 113 identified to species, 39 to genus only, and 3 to family only. The most common weed contaminants, occurring in 20 or more years of the study period, were foxtail (*Alopecurus* spp.), windgrass (*Apera spica-venti* (L.) P. Beauv.), common lamb's-quarters (*Chenopodium album* L.), wild carrot (*Daucus carota* L. subsp. *carota*), downy brome (*Bromus tectorum* L.), henbit (*Lamium amplexicaule* L.), witchgrass (*Panicum capillare* L.), annual bluegrass (*Poa annua* L.), and rattail fescue (*Vulpia myuros* (L.) C. C. Gmel.) (Table 1).

A trend of decreasing percentage of contaminated lots was identified by regression analysis for the following species: windgrass ($r^2$=0.56, F <0.001), downy brome (*Bromus tectorum* L.) ($r^2$=0.73, F <0.001), shepherd's-purse (*Capsella bursa-pastoris* (L.) Medik.) ($r^2$=0.38, F=0.003), henbit ($r^2$=0.32, F=0.007), poplar hybrids (*Populus* spp.) ($r^2$=0.64, F=0.003), Lemmon's alkaligrass (*Puccinellia lemmonii* (Vasey) Scribn.) ($r^2$=0.69, F <0.001), curly dock (*Rumex crispus* L.) ($r^2$=0.44, F <0.001), common groundsel (*Senecio vulgaris* L.) ($r^2$=0.35, F=0.005), and rattail fescue ($r^2$=0.23, F=0.03). No contaminants were found to have a trend of increasing percentage of contaminated lots over time.

Rough bluegrass

Within the 11 years included in the RBG survey, 40 weed contaminants were detected, including 26 identified to species and 14 to genus. The most common contaminants, occurring annually, were windgrass, KBG, and rattail fescue.

A significant trend of declining percentage of lots containing KBG was found ($R^2$=0.72, F=0.001). This is the only contaminant in RBG with a significant increasing or decreasing trend with respect to time.

Ergot

Between 2002 and 2012, the percentage of lots with ergot ranged from 22 to 61% for KBG and 0 to 10% for RBG (Figure 1). Among the three production areas in Oregon (Columbia Basin, central Oregon, and Grand Ronde Valley), the percentage of lots with ergot varied among years and areas (Figure 2). As few as 18% of lots from central Oregon had ergot in 2002, and as many as 82% of lots from the Grand Ronde Valley had ergot in 2006. In most years, a higher percentage of samples with ergot were found in the Grande Ronde Valley than in the Columbia Basin or central Oregon.

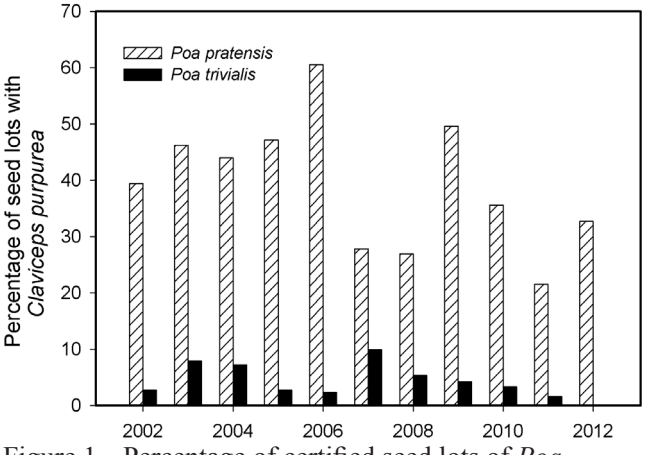


Figure 1. Percentage of certified seed lots of *Poa pratensis* and *Poa trivialis* contaminated with *Claviceps purpurea* (sclerotia) during 2002–2012.

Table 1. Frequency of occurrence of the most common weed species found in *Poa pratensis* L. (Kentucky bluegrass) seed lots grown in Oregon and the range of percentage of seed lots contaminated each year. Data summarized for years 1986–1995 and 2002–2012 for taxa occurring in 10 or more years out of 21.

| Weed species | Common name | Frequency[1] | Range[2] |
|---|---|---|---|
| | | | (%) |
| *Alopecurus* spp. | Foxtail | 20 | 0–7.1 |
| *Amaranthus* spp. | Pigweed | 11 | 0–4.0 |
| *Amaranthus retroflexus* L. | Redroot pigweed | 10 | 0–.2 |
| *Amsinckia* spp. | Fiddleneck | 11 | 0–0.7 |
| *Anthemis cotula* L. | Dogfennel | 16 | 0–3.9 |
| *Apera spica-venti* (L.) P. Beauv. | Windgrass | 21 | 0.6–5.1 |
| *Brassica* spp. | — | 10 | 0–0.7 |
| *Bromus tectorum* L. | Downy brome | 21 | 0.3–8.2 |
| *Capsella bursa-pastoris* (L.) Medik. | Shepherd's-purse | 12 | 0–3.2 |
| *Chenopodium album* L. | Common lamb's-quarters | 20 | 0–4.4 |
| *Chorispora tenella* (Pall.) DC. | Blue mustard | 16 | 0–2.6 |
| *Daucus carota* L. subsp. *carota* | Wild carrot | 21 | 0.9–3.1 |
| *Echinochloa crus-galli* (L.) P. Beauv. | Barnyardgrass | 11 | 0–3.8 |
| *Elymus repens* (L.) Gould | Quackgrass | 10 | 0–0.4 |
| *Festuca* spp. | Fescue | 11 | 1.0–5.5 |
| *Festuca arundinacea* Schreb. | Tall fescue | 11 | 0–1.5 |
| *Galium* spp. | Bedstraw | 14 | 0–0.9 |
| *Lamium amplexicaule* L. | Henbit | 20 | 0–8.6 |
| *Lolium* spp. | Ryegrass | 11 | 0–7.0 |
| *Malva neglecta* Wallr. | Common mallow | 19 | 0–2.8 |
| *Matricaria discoidea* DC. | Pineappleweed | 14 | 0–2.0 |
| *Panicum capillare* L. | Witchgrass | 21 | 1.3–6.1 |
| *Poa annua* L. | Annual bluegrass | 20 | 0–11.5 |
| *Poa bulbosa* L. | Bulbous bluegrass | 16 | 0–2.0 |
| *Poa compressa* L. | Canada bluegrass | 10 | 0–2.4 |
| *Poa secunda* J. Presl. | Big bluegrass | 10 | 0–1.4 |
| *Poa trivialis* L. | Rough bluegrass | 11 | 0–11.1 |
| Poaceae | Poaceae | 13 | 0–1.0 |
| *Polygonum aviculare* L. | Prostrate knotweed | 15 | 0–1.5 |
| *Puccinellia* spp. | Alkaligrass | 17 | 0–7.6 |
| *Puccinellia lemmonii* (Vasey) Scribn. | Lemmon's alkaligrass | 14 | 0–10.1 |
| *Rumex crispus* L. | Curly dock | 19 | 02–3.1 |
| *Salsola* spp. | Russian thistle | 13 | 0–1.5 |
| *Senecio vulgaris* L. | Common groundsel | 15 | 0–3.6 |
| *Setaria italica* (L.) P. Beauv. subsp. *viridis* (L.) Thell. | Green foxtail | 15 | 0–1.3 |
| *Sisymbrium altissimum* L. | Tumble mustard | 12 | 0–1.4 |
| *Solanum villosum* Mill. | Hairy nightshade | 16 | 0–1.4 |
| *Stellaria media* (L.) Vill. | Common chickweed | 10 | 0–4.7 |
| *Taraxacum officinale* F. H. Wigg. aggr. | Dandelion | 15 | 0 -0.9 |
| *Thlaspi arvense* L. | Field pennycress | 12 | 0–4.0 |
| *Triticum* spp. | Wheat | 11 | 0–4.3 |
| *Vulpia myuros* (L.) C. C. Gmel. | Rattail fescue | 21 | 2.1–20.9 |

[1]F = Frequency of occurrence (years out of 21)

[2]Range = Percentage of seed lots contaminated within a year

**Discussion**

Results from this study indicated a large diversity of weed seed contaminants in KBG and RBG seed lots. Most contaminant species occurred at a low level and in few years. This indicates that seed growers are, for the most part, utilizing effective weed management practices for seed production and that seed cleaners are effectively removing most of the contaminants prior to sampling and testing.

Weeds listed as problematic in KBG and RBG seed production fields in central Oregon included downy brome, rattail fescue, common groundsel, prickly lettuce (milk thistle) (*Lactuca serriola* L.), common mallow (*Malva neglecta* Wallr.), stinking chamomile (*A. cotula* L.), pinweed (*Erodium cicutatrium* (L.) L. Hér.), curly dock, and quackgrass (*Elymus repens* (L.) Gould) (Butler et al., 2002a, 2002b). Not surprisingly, these species were some of the common contaminants in seed samples.

Weed contaminants such as windgrass, wild carrot, downy brome, witchgrass (*Panicum capillare* L.), and rattail fescue, which occurred annually in KBG, indicate difficulty in control within the field as well as in separating out the weed seeds during seed cleaning operations. Limited effective chemical control options for species such as wild carrot and rattail fescue result in production of large quantities of seed, which are harvested with the KBG crop. Physical properties (such as size, shape, and/or density) of these species' seed are also similar to those of KBG seed, making it difficult to separate the seed from KBG seed during seed cleaning. In addition, these weed species are common in the grass seed production areas of Oregon east of the Cascade Range (Colquhoun et al., 2001).

In RBG, the most significant weed contaminants were KBG and rattail fescue. During 2002 to 2005, 20 to 27% of samples contained KBG, but the percentage dropped to 8 to 12% during 2007 to 2012, indicating improved management of KBG.

The sources or mechanisms of weed seed contamination in seed lot samples were not determined and are beyond the scope of this study. We hypothesize that the sources of most contaminants were weed populations persisting in individual fields, but we cannot exclude the possibility of contaminant sources outside the production fields, including wind-borne seed or inadvertent introduction of contaminants during transport, storage, or conditioning of seed lots. Additional studies would be needed to determine the source of specific weed contaminants.

Ergot occurred at a much higher frequency in KBG than in RBG. It is likely that RBG is not as susceptible as KBG to ergot. In most years, *C. purpurea* was

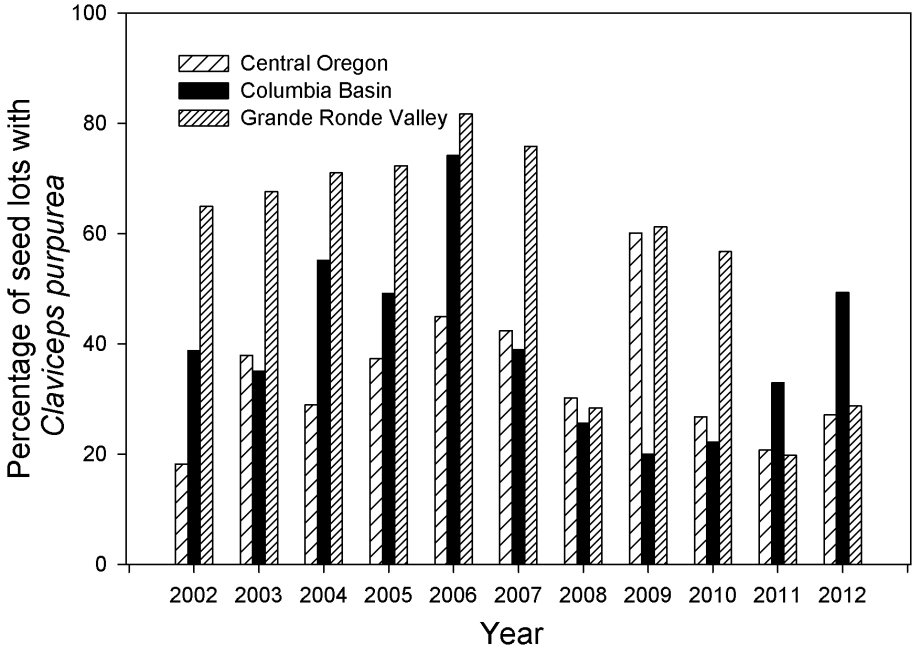


Figure 2. Percentage of certified seed lots of *Poa pratensis* grown in central Oregon, the Columbia Basin, and the Grand Ronde Valley contaminated with *Claviceps purpurea* (sclerotia) during 2002–2012.

most prevalent in the Grand Ronde Valley; however, it is not clear whether this is due to environmental conditions or to the bluegrass cultivars grown in that region. Most cultivars are unique to each production area. In addition, the cultivars grown within each area vary from year to year as new cultivars are introduced and replace existing cultivars. Although most cultivars are susceptible to ergot, some have a greater level of resistance than others. Some of the yearly variation in ergot can be accounted for by environmental conditions, which can affect the timing of pathogen spore release. Current management of ergot relies to a large extent on fungicide use (Pscheidt and Ocamb, 2013), which provides only partial control.

This study suggests that robust weed management practices, coupled with awareness on the part of seed cleaning facilities, results in the production of *Poa* spp. crops with minimal weed seed contaminants. Ergot likely will continue to be problematic in bluegrass spp. seed production and as a seed contaminant in cleaned seed.

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