Impact of nitrogen fertilization and stubble burning practices on the downy brome weed seedbank in a winter wheat/summer fallow rotation. Exp.#95-320. Experimental plots were initiated in 1931 at the Pendleton Experiment Station to study the long-term effects of crop residue management practices on soil properties and sustained crop production in a dryland winter wheat crop rotation. This site is one of the oldest replicated research experiments in the western U.S. with a documented history of crop variety, tillage, date of seeding, and grain yield. The rotation is dryland winter wheat/summer fallow with conventional moldboard plow tillage. Specifically, nitrogen fertilization, organic amendment application, and stubble burning practices are being compared. Treatments are imposed on plots each crop year in the wheat/fallow rotation, and a corresponding set of plots are treated in alternate years so that both fallow and cropped plots are available for observation in any given year. Soil samples were taken in both the post-harvest stubble plots and pre-plant to winter wheat in the autumn of 1994 to evaluate differences in downy brome seed populations due to various long-term treatments. The experimental design is an ordered block consisting of nine treatments and two replications. Plot size is 11.6 by 40.2 m. Treatments included: no burning+80 lb/A N, no burning+40 lb/A N, no burning+0 lb/A N, no burning+pea vine addition (equivalent to 30 lb/A N), no burning+manure addition (equivalent to 100 lb/A N), spring burning of wheat stubble+80 lb/A N, spring burning of wheat stubble+40 lb/A N, spring burning of wheat stubble+0 lb/A N, and fall burning+0 lb/A N. These treatments have been applied in each crop year since initiation of the study in 1931. Treatments which received N (34-0-0 broadcast) were fertilized in October prior to seeding. Pea vines, or manure were broadcast in April prior to seeding. Multiple soil cores to a depth of 2 in. were taken in November of 1994 after winter wheat harvest and to a depth of 6 in. at time of planting winter wheat in the alternate series of the same experiment. Downy brome seed was separated from the soil mineral fraction by flotation in a magnesium sulfate solution and sieving to extract seed. Downy brome seed were counted and expressed as number of apparently viable seed per $m^2$. Seeds that were physically damaged or decayed were also counted and recorded as dead seed per $m^2$.

Results indicate that long-term application of the 40 and 80 lb/A rate of N without stubble burning resulted in high post-harvest levels of downy brome seed in the soil. The 40 lb/A N rate without stubble burning also had high downy brome seed numbers pre-plant to wheat planting. The higher level of seed from 40 compared to 80 lb/A N pre-plant and post-harvest may have been a function of wheat competitiveness with downy brome at high N application rate. Organic amendments of pea vines or manure did not increase downy brome seed bank to the extent of chemical N application. Spring burning of wheat stubble prevented post-harvest downy brome seed increases in the soil caused by N fertilization. However, the differences were not evident pre-plant.

Downy brome seedbank estimates from soil samples taken pre-plant to winter wheat (6 inch depth) and in post-harvest winter wheat stubble (2 inch depth).

| | | Pre-plant | | | Post-harvest | | |
|---|---|---|---|---|---|---|---|
| Burn | Nitrogen | Live | Dead | Total | Live | Dead | Total |
| | lb/A | seed/$m^2$ | | | | | |
| NB | 80 lb N | 26 | 1395 | 1421 | 947 | 39 | 986 |
| NB | 40 lb N | 197 | 1842 | 2039 | 1500 | 26 | 1526 |
| NB | Man | 132 | 1000 | 1032 | 592 | 0 | 592 |
| NB | Pea | 26 | 513 | 539 | 224 | 13 | 237 |
| NB | 0 lb N | 13 | 237 | 250 | 237 | 53 | 290 |
| SB | 80 lb N | 53 | 671 | 961 | 329 | 0 | 329 |
| SB | 40 lb N | 66 | 171 | 237 | 105 | 0 | 105 |
| SB | 0 lb N | 39 | 368 | 407 | 118 | 0 | 118 |
| FB | 0 lb N | 26 | 53 | 49 | 118 | 0 | 118 |
| | LSD(0.05) | 108 | 645 | | 443 | ns | |

NB - No residue burning, SB - spring burn, FB - fall burn, Man - manure, Pea - pea vine.
Manure application approximately 100 lb/A N, and pea vines approximately 30 lb/A N.