# Prosaro Fungicide and Cultivar Selection as Management Tools to Control Disease on Hard Red Winter Wheat, Langdon, 2007

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## MATERIALS AND METHODS

A study was conducted at North Dakota State University Langdon Research Extension Center to determine the efficacy of Prosaro fungicide (421 SC 3.57 lb/gal. formulation of prothioconazole/tebuconazole, 19% +19% w/w, manufactured by Bayer Crop Science) for control of leaf and head diseases on hard red winter wheat (HRWW) cultivars. The study, conducted in 2007, was designed as randomized complete block with a split plot arrangement with four replicates. Whole plots were HRWW cultivars. Split plots were treatments with fungicide or no fungicide. The cultivars tested were 'CDC Falcon, Jagalene, Jerry, Ransom, and Wesley'. The plots were seven rows wide seven-inch row spacing and measured 20 feet long. A double disk no-till drill was used to direct seed the plots into flax stubble in mid September 2006. Additional plots were planted between the treated and untreated plots to minimize spray drift to adjacent plots. Fertilizer was spring applied by broadcast method. A *Fusarium* grain inoculum was hand- broadcast in equal amounts on the plot area, three weeks prior to heading. A solution of Prosaro fungicide and Induce adjuvant (Helena Chemical Co.) was applied at 6.5 fl oz /acre and 0.125%v/v. The fungicide treatments were applied when the crops was at early anthesis growth stage (Feekes 10.51) with a $CO_2$-pressurzed backpack sprayer. The boom was equipped with two Spraying Systems Co. XR8001 nozzles mounted on a double swivel. The swivels were spaced on 20 inch centers and oriented to spray 30 degrees downward from horizontal and forward and backward. The spray volume was 18.4 GPA obtained by pressurizing the boom at 40 psi. Fungicide was applied on two dates as the cultivars had reached anthesis on two different dates. Leaf disease evaluations were recorded 12 and 20 days after flower initiation by assessing five leaves per plot visually and estimating the necrotic and infected area per leaf. Twenty days after the fungicide application (soft dough growth stage, Feekes 11.2) 20 heads were removed and evaluated to determine FHB incidence (number of spikes infected) and field severity of the infected heads. Field severity rating (index) is the summation of the spikes infected (number of FHB infected kernels per head divided by total kernels). The plots were harvested with a plot combine and the sample processed to determine yield, test weight, and protein. A sub sample of the grain was ground and sent to North Dakota State University to determine the presence of the toxin deoxynivalenol (DON). North Dakota State University Extension recommended production practices for hard red winter wheat for Northeast North Dakota were followed. Data was analyzed with the general linear model (GLM) in SAS. Fischer's protected least significant differences (LSD) were used to compare means at the 5% probability level (Table 1).

RESULTS

Primary diseases present were tan spot caused by the pathogen *Pyrenophora tritici-repentis* and leaf rust, caused by the pathogen *Puccinia triticina* (formerly *recondita* f. sp. *tritici*). Leaf rust was visible on the flag leaf of Jagalene shortly after emergence from the leaf sheath. An additional fungicide application to this cultivar may have resulted in further economic benefit due to the early arrival of the spores and the cultivar's susceptibility to leaf rust. Leaf disease sampling was sample earlier than the normal 20 days after anthesis to differentiate among treatments because of the early development and high rust incidence. Rust also was present at much lower levels on CDC Falcon. Tan spot caused most of the other foliar infection on the other cultivars. A very low level of winter injury was observed on two Jagalene plots, less than 10%. June precipitation levels were much greater than 30-year normals.

The Prosaro fungicide application was very effective in controlling foliar disease measured early on Jagalene and Ransom (Table 2). The application of Prosaro fungicide reduced leaf disease severity averaged across all cultivars measured at Feekes 11.2 growth stage by nearly 1/4 (Figure 1). Averaged across all cultivars a fungicide treatment reduced FHB incidence by 64% (Figure 2). Fusarium head blight incidence was greater on the cultivars Jagalene, Jerry, Wesley compared to CDC Falcon and Ransom (Figure 3). FHB field severity or index was different among cultivars and treatments (Table 2). FHB head severities were also different between treatments on Jagalene and Wesley (Table 2). Response in yield from fungicide was variable ranging from an increase of 43.2 bushel/ acre on Jagalene to 1.4 bushel non significant increase on Ransom. Significant responses would provide economic benefit at current market prices. Fungicide increased test weight on all cultivars, very substantially on Jagalene and Wesley (Table 2). Protein was increased on Wesley but decreased on Ransom. When protein usually decreases it is usually a result of a large yield increase due to the fungicide application. That was not found in this study. The deoxynivalenol concentration was not significantly affect by a fungicide treatment on CDC Falcon and Wesley but was reduced on Jagalene, Jerry and Ransom (Figure 4). The fungicide applications to Jerry and Ransom would have eliminated any price discount.

Table 1. Source of variation and confidence levels for significant differences among leaf disease severity measured early and late, Fusarium head blight incidence, field severity and head severity, yield, test weight, protein and deoxynivalenol on winter wheat Langdon, 2007.

| Source of Variation | Early Leaf Severity | Late Leaf Severity | FHB | | | Yield | Test Weight | Protein | DON |
|---|---|---|---|---|---|---|---|---|---|
| | | | Incidence | Field Severity | Head Severity | | | | |
| Cultivar | <0.0001 | 0.3729 | <0.0001 | <0.0001 | 0.0763 | <0.0001 | <0.0001 | 0.0029 | <0.0001 |
| Rep*Cult | 0.3191 | 0.4456 | 0.5138 | 0.0049 | 0.0404 | 0.6167 | 0.7342 | 0.0011 | 0.7577 |
| Fungicide | 0.1637 | <0.0001 | 0.0001 | <0.0001 | 0.0031 | <0.0001 | <0.0001 | 0.4442 | <0.0001 |
| Cult*Fung | 0.0303 | 0.1313 | 0.9529 | 0.0107 | 0.0349 | 0.0012 | <0.0001 | 0.0023 | 0.0134 |
| % C.V. | 9 | 31 | 27 | 53 | 12 | 10 | 1 | 2 | 37 |

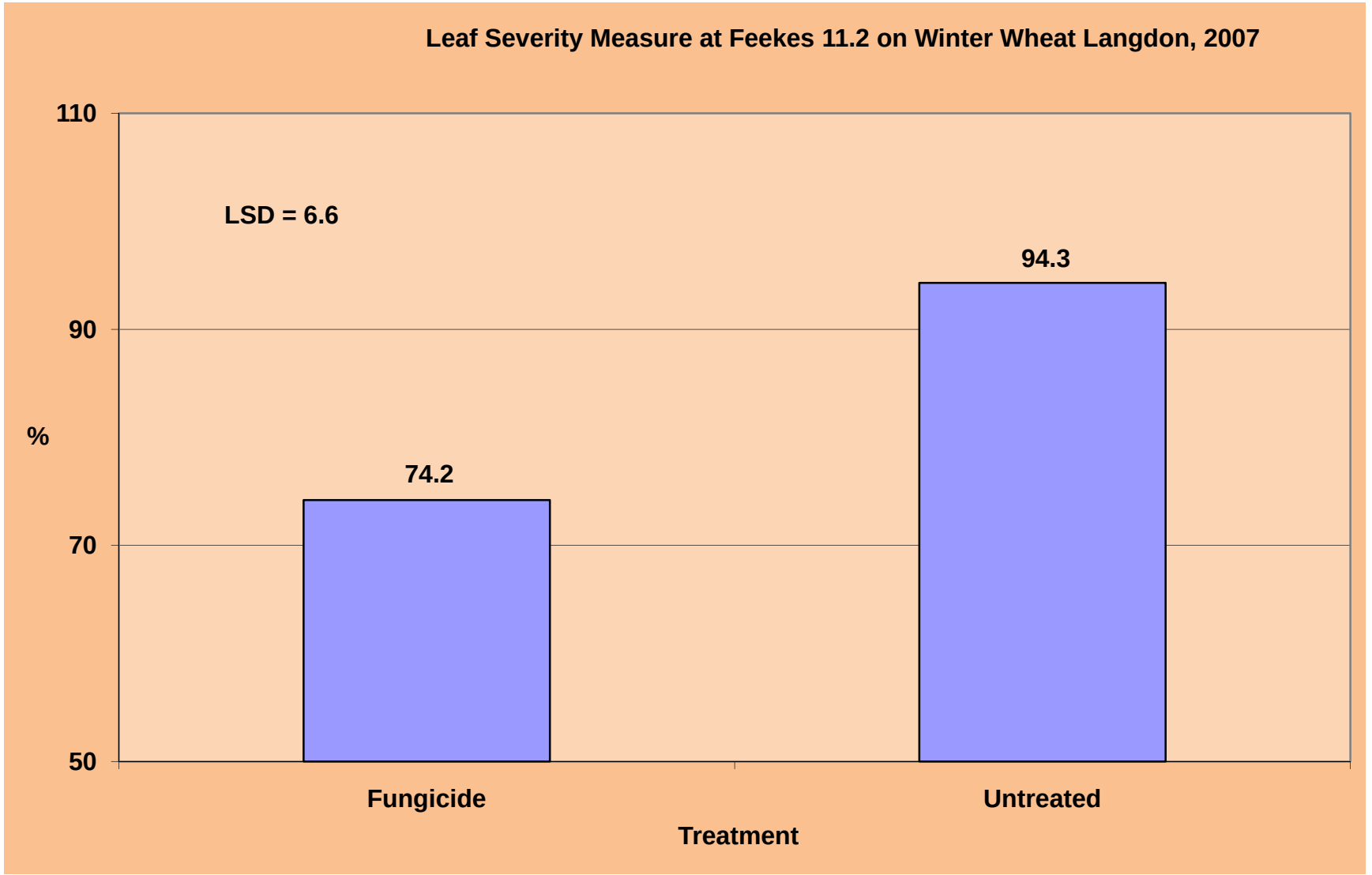

Figure 1. Leaf severity measured at Feekes 11.2 growth stage averaged across all winter wheat cultivars by treatment.

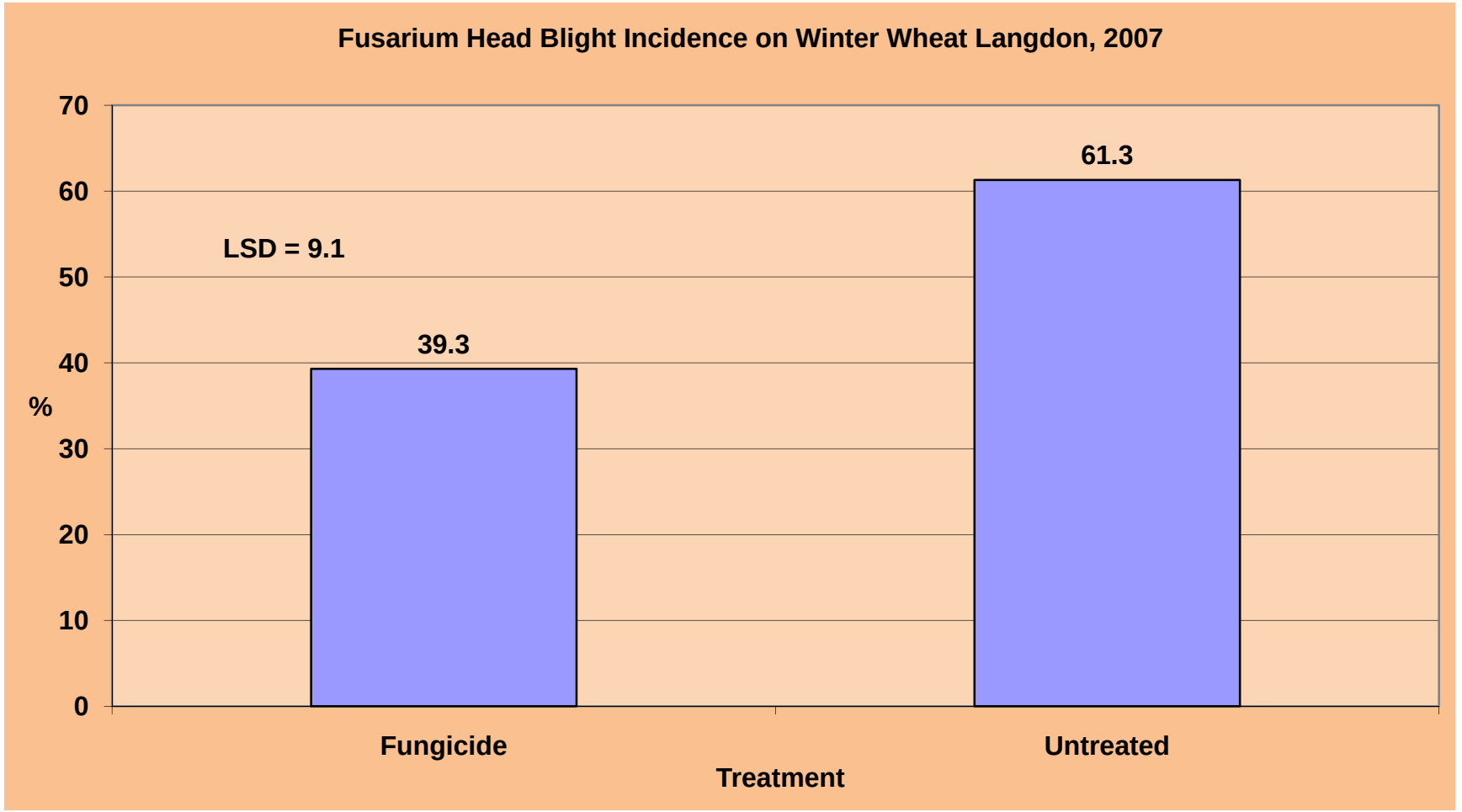

Figure 2. Fusarium head blight incidence averaged across all winter wheat cultivars by treatment.

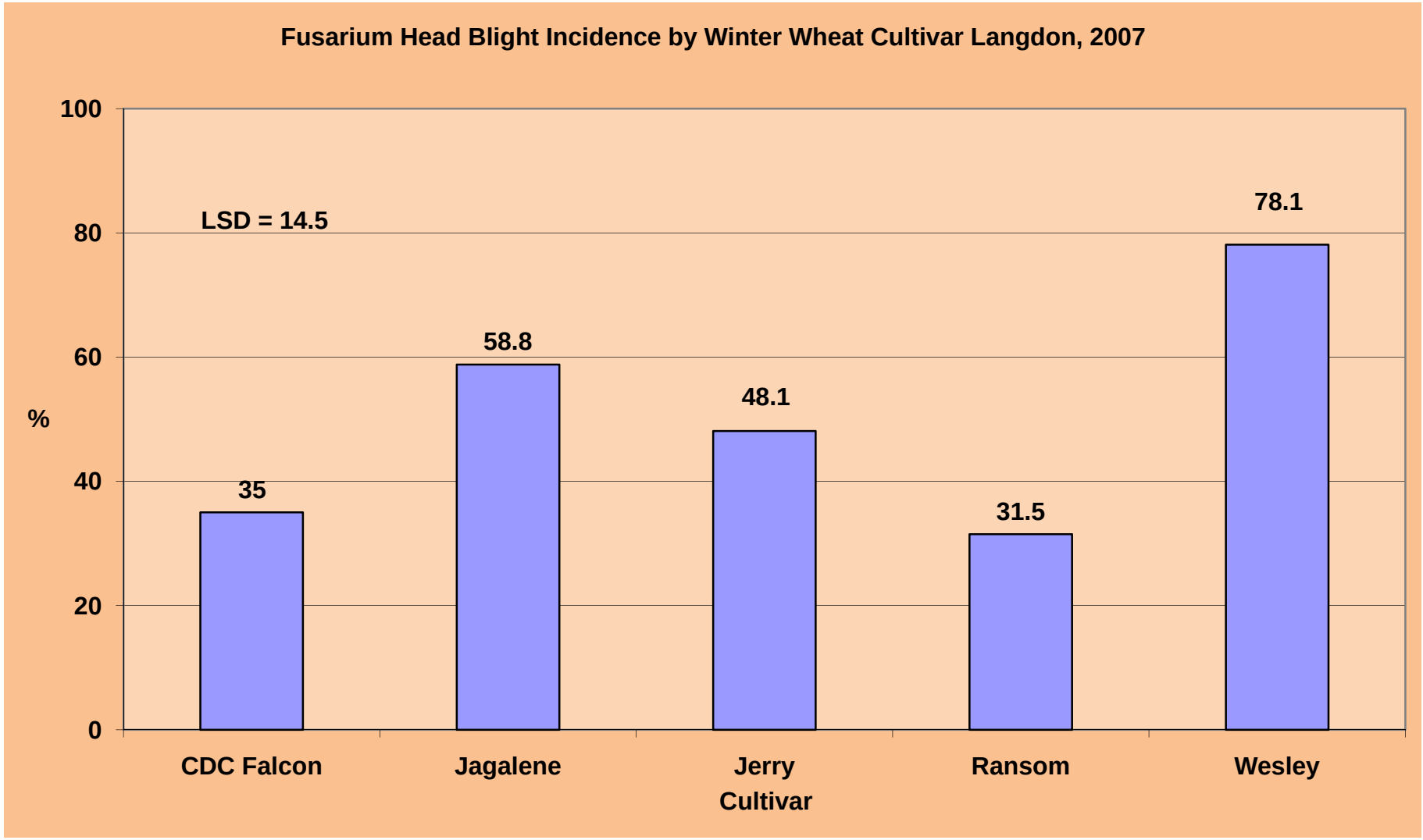

Figure 3. Fusarium head blight incidence averaged across all treatments by winter wheat cultivar.

Table 2. Early leaf severity, FHB field severity and head severity, yield, test weight and protein by cultivar and treatments Langdon, 2007.

| Cultivar | Treatment | Early Leaf Severity (%) | FHB Field Severity (%) | Head Severity (%) | Yield (Bu /acre) | Test Weight (Lb/ bu) | Protein (%) |
|---|---|---|---|---|---|---|---|
| CDC Falcon | Prosaro | 69.8 | 0.4 | 8.6 | 101.5 | 60.0 | 11.3 |
| | Untreated | 73.3 | 2.6 | 10.5 | 77.9 | 57.1 | 11.0 |
| Jagalene | Prosaro | 89.0 | 3.0 | 9.9 | 80.7 | 59.1 | 11.7 |
| | Untreated | 98.2 | 11.4 | 20.9 | 37.5 | 52.3 | 12.1 |
| Jerry | Prosaro | 55.1 | 1.5 | 11.8 | 102.5 | 59.3 | 12.4 |
| | Untreated | 50.6 | 3.7 | 10.7 | 88.8 | 58.3 | 12.0 |
| Ransom | Prosaro | 69.1 | 0.4 | 7.8 | 90.2 | 59.7 | 11.3 |
| | Untreated | 62.4 | 1.6 | 8.2 | 88.8 | 59.0 | 11.8 |
| Wesley | Prosaro | 61.3 | 6.1 | 12.2 | 90.2 | 58.1 | 13.0 |
| | Untreated | 74.5 | 14.9 | 19.7 | 60.4 | 53.9 | 12.5 |
| LSD | | 4.8 | 1.8 | 2.8 | 6.0 | 0.6 | 0.2 |

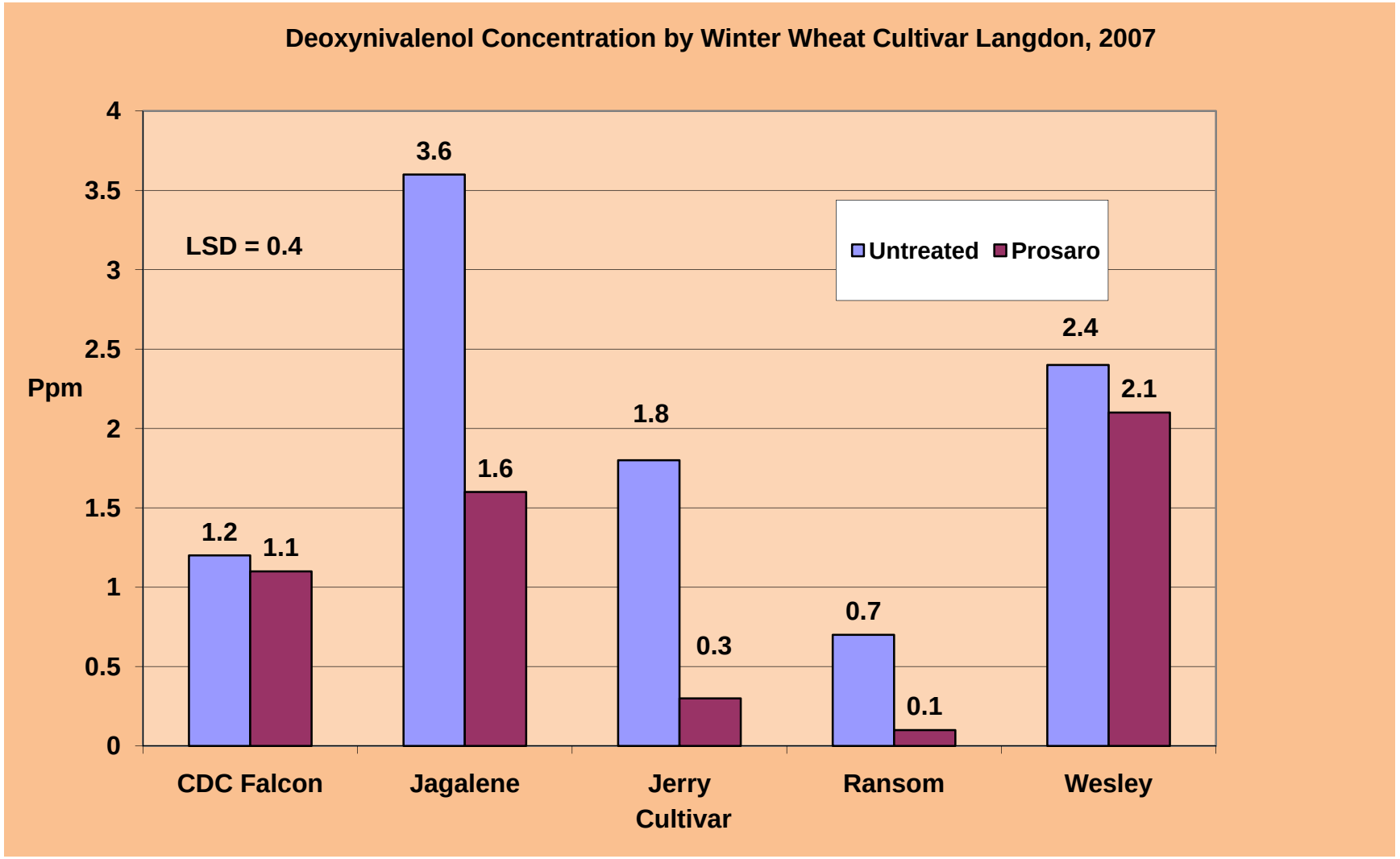

Figure 4. Deoxynivalenol concentration by cultivar and treatment.