

**Title:** Control and Management of Common Smut on Corn in the Columbia Basin of Oregon and Washington

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**Project Status:** New, February 1, 1999 to December 31, 1999

**Project Funding:** \$1500

**Objectives:**

1. Screen Field corn and Sweet corn germplasm for resistance to common smut
2. Evaluate fungicides for the control of common smut.
3. Investigate the effects of irrigation systems on incidence of common smut.
4. Investigate the effects of planting dates on development of common smut in the Columbia Basin.

**Progress Report**

Objectives 1,4. Variety screening/Planting date: Seventeen sweet corn cultivars, grown commercially in the Columbia basin for processing, were evaluated for resistance to common smut. Plots were established on two planting dates (Apr 22 and May 29), with 4 rows/30' plot on the Hermiston AREC. The experimental design was a randomized complete block, with four replications. Cool extremely windy weather severely damaged the Apr 22 planting; both plantings were damaged slightly by a hailstorm on Jun 24. At ear maturity, plant stand was noted, and the number and location (at soil line, between soil line and ear, on ear, between ear and tassel, on tassel) of smut galls was recorded for each plant. Although there was no significant difference in percent ears infected due to planting date, the varieties responded somewhat differently with different planting dates (Table 1). The most susceptible varieties over both planting dates included 1861, 1703, and Krispyking. Varieties exhibiting the least percent infected ears were 2547, Elite, ACX 405, ACX 427, Stylepak, SS 8100b, and ACX 429. The two most commonly planted varieties (Jubilee and Supersweet Jubilee) were susceptible.

Objective 2. Three systemic and one protectant fungicide were evaluated for the control of common smut; Folicur (Bayer Inc), Stratego (Novartis Crop Protection), Quadris (Zeneca Ag Products), and Bravo (Zeneca Ag Products). 'SuperSweet Jubilee' sweet corn and 'Pioneer 3563' field corn were planted on Apr 27 and May 28, respectively. Fungicides were applied once by chemigation through the center pivot at silking (sweet corn) or just as silking began (field

corn). At maturity individual plants were observed for infection and the site of infection (at base, between base and ear, on ear, between ear and tassel, and on tassel) was recorded. Some plants had more than one infection. Only a single replicate of each fungicide was applied.

Overall, sweet corn was more susceptible to common smut than field corn, averaging nearly 50% infected plants compared with 25% for field corn (Table 2). Infections at the soil line and in the upper plant parts (ear, ear to tassel, tassel) occurred to a lesser extent in field corn than sweet corn, but were found more frequently between the base and the ear in the field corn. Because fungicide applications were not made until silking, control of galls low on the plant was not expected since infections may have already occurred before treatment. Highest percentage of ear infection was recorded in the check plots in both corn types. Ear infections ranged from 9-17% in sweet corn and 3-7% in field corn, depending on treatment.

Objective 3. Drop nozzles were compared to overhead sprinklers using center pivot irrigation to see if the reduced moisture in the canopy, particularly on the ears or silk, would reduce infection in the ears. However, cool, extremely windy weather followed by a hailstorm early in the season severely damaged the stalks; the ears formed lower to the ground than normal, so comparison of drop tube sprinklers and normal irrigation practices could not be made.

## **Discussion**

The identification of resistant varieties may provide an effective control tool in the future to control this disease. Several of the varieties tested this summer had significantly fewer infections than the cultivars most widely planted. Use of these varieties alone may not provide adequate protection, but when combined with fungicide applications and/or different cultural practices, acceptable disease control may result. Because of the potential variation between years and the subsequent differences in disease pressure, this work needs to be repeated. Additional lines should be tested in the future for resistance, in conjunction with processing quality evaluation by local processors of each of the lines tested.

Fungicide applications were made at silking to reduce ear infections in 1999. While there was a trend for reduced disease incidence in ears in some treatments, there was no clear indication of disease control with any chemical applied. Large field trials using late-planted susceptible varieties off-station did not provide any additional information. In all off station field trials, extensive infection occurred but primarily low on the plant (at the soil line to below the ear on the main stalk). Future research needs to target application timing and frequency, beginning at emergence and continuing through the growing season.

Planting date again needs to be evaluated. Both large-scale, commercial field tests were late-planted. Although in one field there were many soil line and stem infections, there were few ear infections in either field.

With the identification of a new, significant problem of kernel discoloration of sweet corn associated with corn smut or a smut-like pathogen, work is needed to confirm the identification of the fungus, varietal susceptibility, and disease control strategies is needed.

Table 1. Effect of planting date and cultivar on susceptibility of sweet corn to common smut.

| Cultivar  | Planting date |            | Average    |
|---|---------------|------------|------------|
|   | Apr 22        | May 29     |            |
| %%% |               |            |            |
| <i>Infected ears (%)</i>  |               |            |            |
| 1861  | 39.7a         | 22.9abc    | 31.3a      |
| 1703  | 34.2ab        | 18.4abcd   | 26.3ab     |
| Krispyking  | 22.2 cd       | 27.3a      | 24.7abc    |
| Jubilee   | 19.1 cde      | 24.0ab     | 21.6 bcd   |
| 2684  | 23.8 bc       | 15.9abcde  | 19.9 bcd   |
| Challenger  | 20.1 cde      | 15.4abcde  | 17.7 cdef  |
| C&S 710   | 11.5 cdefgh   | 23.2abc    | 17.3 cdef  |
| Sheba   | 16.3 cdefg    | 16.0abcde  | 16.2 cdefg |
| SS Jubilee  | 10.8 defgh    | 17.1abcd   | 14.0 defg  |
| HMX 5372  | 17.6 cdef     | 3.4 ef     | 10.5 efgh  |
| ACX 429   | 6.3 fgh       | 14.1abcdef | 10.2 efghi |
| SS 8100b  | 9.0 efgh      | 10.6 bcdef | 9.8 efghi  |
| Stylepak  | 4.2 gh        | 12.5 bcdef | 8.4 fghi   |
| ACX 427   | 9.1 efgh      | 5.0 def    | 7.1 ghi    |
| ACX 405   | 3.8 h         | 10.2 cdef  | 7.0 ghi    |
| Elite   | 1.9 h         | 3.5 ef     | 2.7 hi     |
| 2547  | 0.8 h         | 1.8 f      | 1.3 i      |

Variety means followed by the same letter are not significantly different from each other.

Table 2. Effect of center pivot chemigation of fungicides on development of common smut of corn.

| Treatment   | Gall location |      |          |     |            |        |
|---|---------------|------|----------|-----|------------|--------|
|   | None          | Base | Base-Ear | Ear | Ear-Tassel | Tassel |
| %%% |               |      |          |     |            |        |
| <i>Percent plants (%)</i>   |               |      |          |     |            |        |
| <u>Sweet Corn</u>   |               |      |          |     |            |        |
| Folicur   | 47            | 13   | 13       | 9   | 10         | 17     |
| Stratego  | 46            | 18   | 23       | 11  | 19         | 12     |
| Quadris   | 44            | 10   | 20       | 15  | 23         | 16     |
| Bravo   | 56            | 7    | 11       | 15  | 9          | 13     |
| Check   | 50            | 8    | 14       | 17  | 12         | 13     |
| <u>Field Corn</u>   |               |      |          |     |            |        |
| Folicur   | 25            | 6    | 71       | 5   | 0          | 0      |
| Stratego  | 27            | 1    | 70       | 6   | 0          | 0      |
| Quadris   | 26            | 4    | 69       | 3   | 0          | 0      |
| Bravo   | 33            | 4    | 62       | 4   | 0          | 0      |
| Check   | 24            | 3    | 72       | 7   | 1          | 0      |