



Wild oat seeds spread in chaff

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Combine harvesting spread wild oat seeds up to 475 feet (145 m) at population levels of more than 1 seed per square foot (10 seeds/m²). This compared to less than 1 seed/ft² at 150 feet (45 m) with chaff collection.

Wild oat distribution is typically patchy in nature, and reducing seed dispersal can help maintain wild oat infestations in patches, allowing targeted weed control and reduced economic impact. Combines, though, disperse weed seeds in chaff. As the combine moves down the field, seeds are picked up, and during threshing the seeds move through the combine and are transported further down the field.

The objectives of this legacy study were to determine the distance of wild oat seed dispersal by a combine harvester, and the effect of chaff collection on this dispersal. While few farms use chaff collection for livestock feed, the study highlights the contribution that chaff collection could have on controlling the spread of wild oat patches.

Two experiments were conducted in 1995 and one in 1996 at Carman, MB. The experiments compared mechanical wild oat seed dispersal with and without chaff collection. Wheat was

windrowed and then harvested with a field scale, self-propelled combine. Straw was chopped and spread.

In 1995, an artificial wild oat patch was created in a 25-foot (7.6 m) strip perpendicular to the plots by spreading and incorporating wild oat seed at a rate of 5 viable seeds/ft² (50 seeds/m²). Harvesting wheat started 65 feet (20 m) before the wild oat patch. Seed traps were placed at 16-foot (5-m) intervals for the first 100 feet (30 m) past the patch and at 33-foot (10-m) intervals for the rest of the sampling distance. The final traps were placed 328 or 394 feet (100 or 120 m) past the back of the wild oat patch in the two 1995 experiments. Traps were placed in the centre of the windrow to catch both chaff and straw, and 2 feet (0.62 m) to one side of the windrow centre to catch straw without chaff.

Approximately 50% of wild oat seed was retained on the wild oat plant at harvest in 1995. Wheat yield in 1995 was 28 bu/ac (1900 kg/ha).

The 1996 experiment followed similar protocols except wild oat was seeded at 4/ft² (41/m²). Approximately 40% of wild oat seeds were remaining on the plant at harvest. The wild oat patch had a density of 500 wild oat seeds/ft² (5,000/m²) in the 1996 experiment compared with 280 and 160 seeds/ft² (2,800 and 1,600 seeds/m²) in the 1995a and 1995b experiments, respectively.

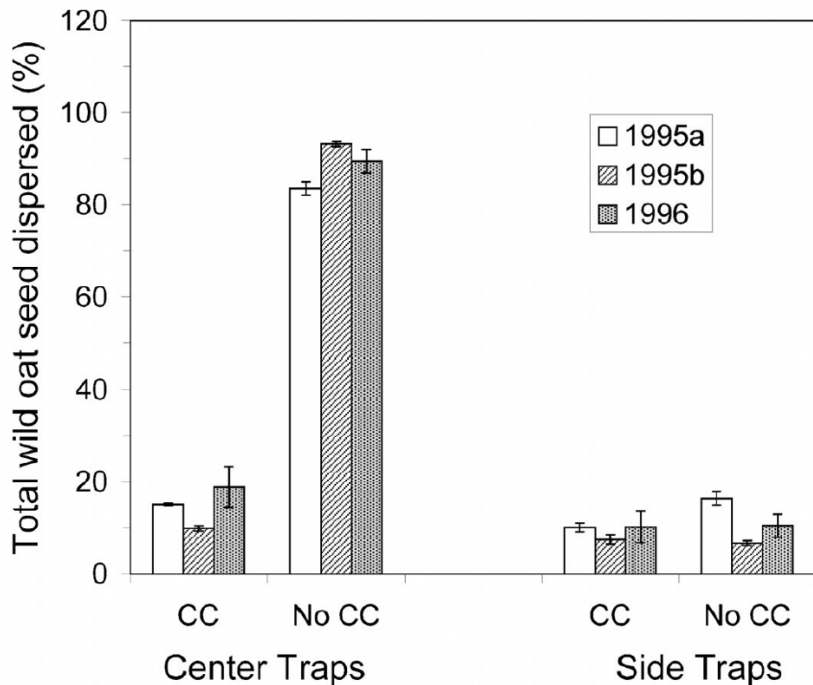
In 1996, the trap series began 33 feet (10 m) before the wild oat patch edge and continued to 800 feet (245 m) past the wild oat patch at intervals of 16 feet (5 m) for the first 82 feet (25 m), and then 33-foot (10-m) intervals between 82 and 345 feet (25 and 105 m), and 66-foot (20-m) intervals between 345 and 800 feet (105 and 245 m).

Wheat yield was 39 bu/ac (2600 kg/ha) in 1996.

Chaff collection reduced the spread of wild oats

Averaged across all traps, chaff collection resulted in a sevenfold reduction in the wild oat seeds dispersed in the center traps. There was no significant difference in wild oat collection for the side traps.

The effect of chaff collection and trap position on the percentage of the total wild oat seed dispersed relative to no chaff collection*



Source: Shirliffe and Entz 2005

*The chaff collection treatment is compared relative to the no chaff collection treatment in which the percentage for the center and side traps total 100%. The percentage for chaff collection does not total 100% because a proportion of the seeds were collected with chaff collection.

Chaff collection reduced the distance that the wild oat seeds were spread. In 1995, very few wild oat seeds were spread beyond 130 feet (40 m) past the wild oat patch. Without chaff collection, wild oat seeds continued to be spread by the combine for the entire measurement distance.

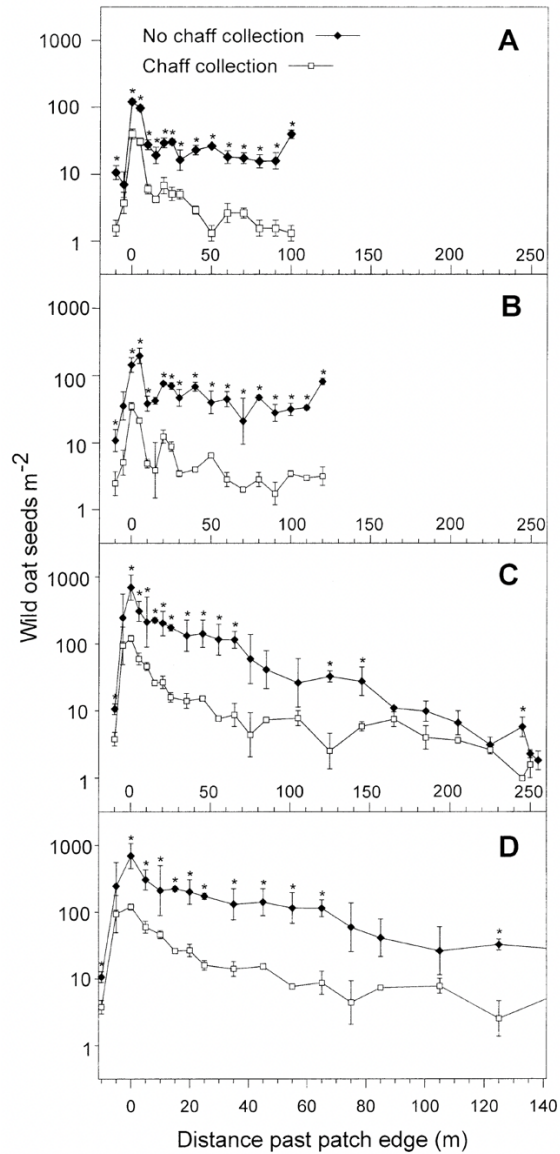
With a larger wheat crop and slower harvest speed, the total dispersal distance was 115% greater and the velocity 55% slower than in 1995. To compensate, the data was scaled to adjust for velocity to allow comparisons between 1995 and 1996 experiments.

This comparison found similar trends between 1995 and 1996 experiments. In all site-years, wild oat seed dispersal was reduced approximately tenfold with chaff collection measured at 65 feet (20 m) in 1995 and 33 feet (10 m) in 1996.

In 1996, without chaff collection, combine harvesting spread wild oat seeds up to 475 feet (145 m) at population levels of more than 1 seed/ft² (10 seeds/m²). This compared to less than 1 seed/ft² (10

seeds/m²) at 150 feet (45 m) with chaff collection. At distances beyond 475 feet, chaff collection had no significant effect on seed dispersal.

Combine harvester dispersal of wild oat with and without chaff collection for the 1995a experiment (A), 1995b experiment (B), and the 1996 experiment, where the same data are presented in both (C) and (D)*



Source: Shirliffe and Entz. 2005

*The scale of the distance past the patch edge has been adjusted for the 1996 experiment in panel D to reflect the slower combine velocity for that year. This allows direct visual comparison of the 1996 experiment with the 1995 experiment on a distance basis (comparing panels C with A and B) or a velocity-adjusted distance basis (comparing panels D with A and B).

Other research has shown that the maximum unassisted dispersal distance of wild oat is only 5 feet (1.5 m). This highlights the impact that a combine can have on spreading wild oat seed beyond initial patches. With many farmers now straight-cutting wheat, these results may not be quite as dramatic today since more wild oat seeds may have already shed prior to combining than in this experiment where the wheat was windrowed.

Nevertheless, chaff collection may still be an important tool in an integrated weed management program because it may slow and reduce the expansion of weed patches. And it also shows the potential for [Harvest Weed Seed Control with impact mills](#) that destroy weed seeds as they exit the combine in chaff.

Shirtliffe SJ, Entz MH. Chaff collection reduces seed dispersal of wild oat (*Avena fatua*) by a combine harvester. *Weed Science*. 2005;53(4):465-470. <https://doi.org/10.1614/WS-03-109R2>

Photo courtesy of Boomerang Chaff Cart