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In-Crop Weed Clipping for Organic Weed Control

Organic farmers need additional means of controlling in crop weeds, especially in poorly competitive crops such as lentil and flax. Cutting off immature weed seed heads and flowers above the crop canopy may reduce the viable weed seed bank resulting in cleaner, higher yielding crops. The Prairie Agricultural Machinery Institute in cooperation with the Marysburg Chapter of the Organic Crop Improvement Association recently completed a 3-year field trial examining the effectiveness of mechanical removal of above canopy weeds and the effect of removal on crop yield and subsequent weed population.

Clipping weeds above the canopy of a crop.

Weed Clipping Equipment

Three methods were assessed for effectiveness in clipping weed seeds above the crop canopy.

1. Standard self-propelled (SP) swather with canvas removed
2. Modified self-propelled (SP) swather
3. Prototype flail chain system developed by Crestview Organic Farms at Assiniboia

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At a Glance

Organic producers have serious annual weed problems. Wild mustard and wild oats are the predominant weeds especially in poorly competitive crops such as lentil and flax.

To reduce the number of weeds going to seed, PAMI modified a wide self-propelled swather to clip weeds above the crop canopy. In addition, PAMI tested a self-propelled swather modified with a series of flails to shred weeds above the crop canopy. The modified swather and swather/flail systems were very successful in removing more than 90% of immature weed seed heads and flowers above the crop canopy.

Long term results include a reduced weed bank in the soil, cleaner crops, reduced weed dockage, and potential for improved crop yield.

Standard SP Swather

Unmodified SP swathers are unsuitable for weed clipping because the swather windrows the weed material into a concentrated mass above crop. The concentrated weed material will block the light to the crop and reduce yields. To attain maximum results, the weed material should be evenly spread over the crop. To achieve even spreading with a swather header, the canvas must be removed to prevent weed windrowing. (The unmodified swather with canvases removed was very effective in cutting the weeds above the crop canopy. However, the weed material quickly built up on the table braces and prevented weeds from dropping back on the crop canopy) (**Figure 1**).

Figure 1. Weed Buildup on the Umodified Table with Canvases Removed.

Modified SP Swather

The second method of weed clipping was with a modified SP swather. A wide SP swather was selected to minimize wheel damage to the crop. A Massey 200 SP swather with a 34 ft (10.4 m) table was modified to prevent hang up of cut weed material on the cutterbar and swather table (**Figure 2 and 3**). A series of modifications to the table and reels were made in order to improve green material flow to the crop. With the exception of a modified canvas system, all other modifications were set up with canvases removed.

The first attempt to clear weed residue from the table was a modified canvas system. The canvas had most of the material removed between the slats to allow weed material to fall through the holes in the canvas (**Figure 4**).

Figure 4. Modified Canvas with Some Canvas Material Removed.

The modified canvas was very effective in moving the product from the table and dropping it into the clipped crop. Unfortunately a small amount of weed material built up in the canvas rollers resulting in failure of the system. Modifications to prevent wrapping were unsuccessful.

Other modifications to the SP swather with canvases removed included: table backboard and draper frame removal; deflectors on knives; and deflectors on table and the addition of flexible PVC belting to the reels to assist in movement of green weed material.

Adding flexible PVC material to the reel bats and extending over the edge was successful in sweeping material from the cutterbar. The extra weight of the PVC belting on the bats bent the reel system and resulted in damage when the bats came in contact with the knife assembly. The reel system on this swather was not as sturdy as

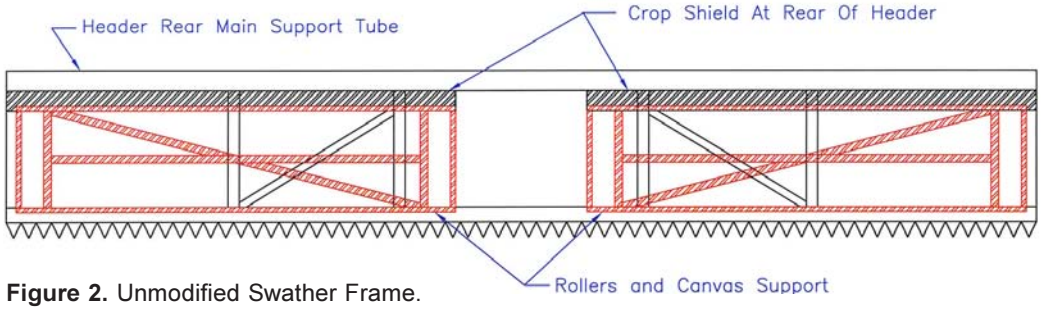

Figure 2. Unmodified Swather Frame.

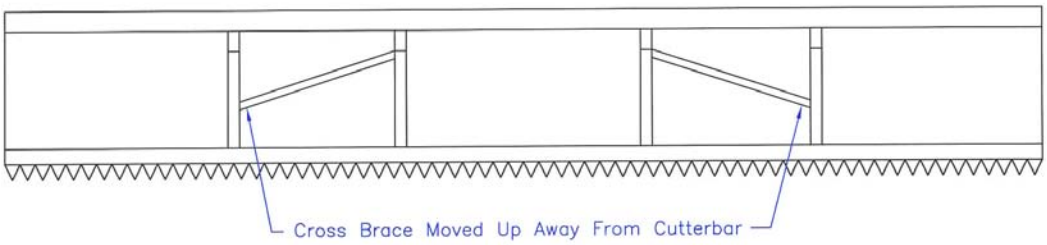

Figure 3. Modified Swather Frame.

most reels so the problem would not likely occur with most makes of swather.

Modifications that were successful in preventing weed material buildup were the addition of half round deflectors on the table cross braces and the repositioning of two angle braces on the table (**Figure 5**).

Figure 5. Weed Clearing on the Modified Table.

Swather with Protoype Flail Chain

The third method of weed clipping was a prototype flail chain system developed by Crestview Organic farms at Assiniboia. The flail system was developed in place of a cutting system, on the theory that flailing causes weed shredding, which may prevent weed regrowth. The flail system consists of a 22 ft (6.7 m) wide series of flail chains that replaces the table on a C.I. 550 SP swather (**Figures 6 and 7**).

Figure 6. CI Swather with Shredder.

Figure 7. Shredder Showing the Flailing System.

Weed clipping data is only shown for year 1, as the flail chain system was not available for testing in years 2 and 3.

Weed Clipping Effectiveness

A number of organic lentil fields were clipped in 2000 and 2001. A check strip was left to assess clipping effectiveness. Clipping effectiveness was measured by counting the number of weed seed heads and flowers above the crop canopy in clipped and check areas. Clipping was very effective in 2000 at both Marysburg and Assiniboia with over 87% of seed heads and flowers removed by the clipping systems (**Figures 8 and 9**).

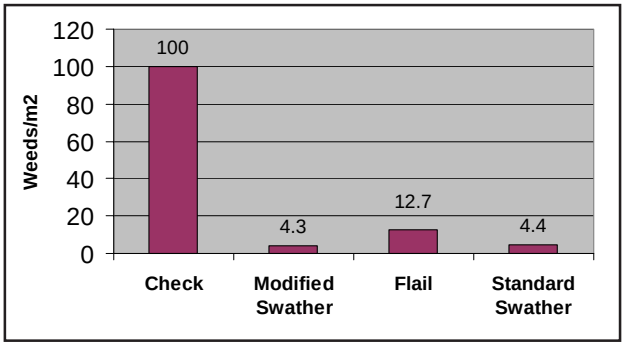

Figure 8. Marysburg Field #1 - Weeds/m² Following Clipping.

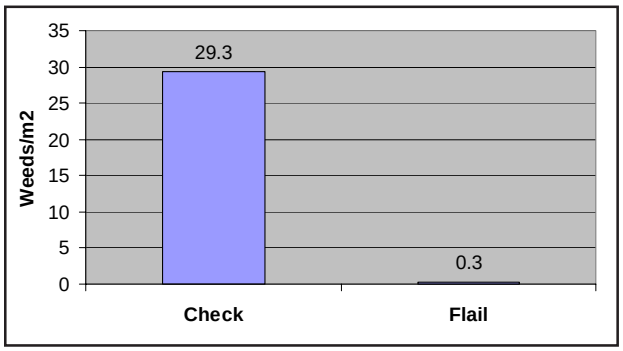

Figure 9. Assiniboia - Weeds/m² Following Clipping.

Most of the weeds in the lentil fields were wild mustard and wild oats. The clipping systems were more effective in removing wild mustard seed heads compared to wild oat panicles.

In contrast to 1999 where wild mustard was the major weed, in 2000 wild oats was predominant with low wild mustard infestation. In the unclipped checks, over 87%

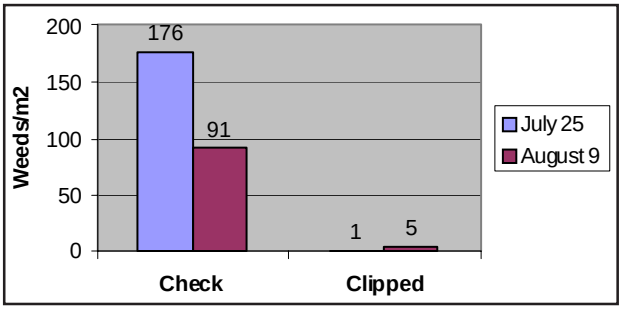

Figure 10. Spalding Field #1 - Weeds/m².

of the weeds above the crop canopy were wild oats (**Figure 10 and 11**).

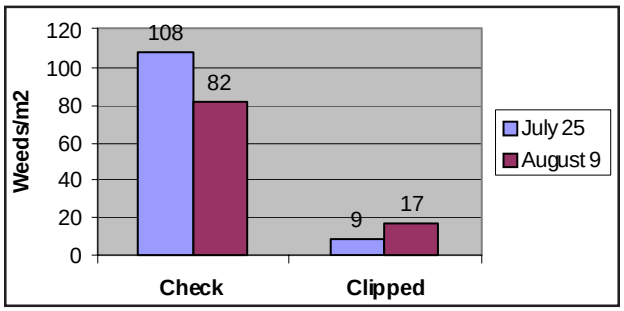

Figure 11. Spalding Field #3 - Weeds/m^2.

In 2000, weed counts taken at two dates indicated that clipping was effective in reducing above canopy weed population over an extended period.

Effect of Weed Clipping on Crop Yield in the Year of Clipping

It was anticipated that weed clipping would not affect crop yield as most weed competition occurs early in the crop's growth cycle. Mixed yield effects resulted in 2000 with higher lentil yields from clipped fields at two of four sites.

Longer Term Effects of Clipping

Weed seed counts were taken in the crop year following clipping in four organic fields in the Spalding area to determine if clipping reduced weed seeds germinating from the weed bank. At three of four sites, the number of weeds in the check area averaged almost four times the weeds in the clipped treatments (**Figures 12 & 13**).

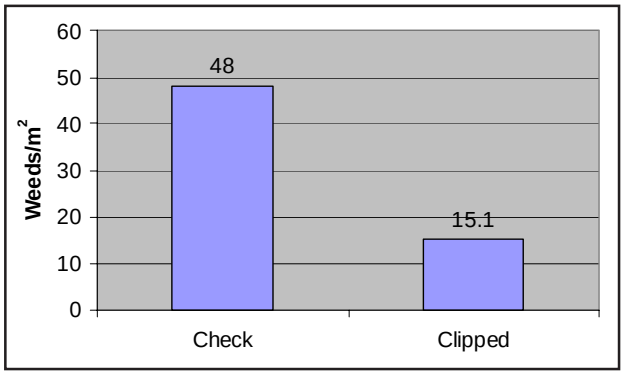

Figure 12. Effect of Weed Clipping on Weed Population 2001 - Site #1.

At the fourth site at Spalding, where the weed populations were much lower, there were only small differences in weed counts between the check and clipped areas.

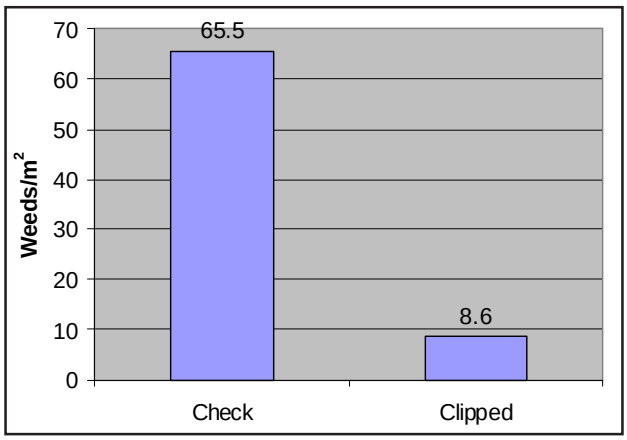

Figure 13. Effect of Weed Clipping on Weed Population 2001 - Site #3.

Effect of weed clipping on grain yield in the year following clipping in the Spalding area was mixed with higher grain yield for the clipped treatments at two of four sites.

The four clipped sites were also followed up in 2002 for the longer term effects of weed clipping. Unfortunately, the severe drought in 2002 resulted in near crop failure and unreliable data.

Conclusions

SP swathers can be modified to effectively clip weeds above the canopy of poorly competitive crops, with removal of up to 90% of above canopy weed seed heads and flowers.

The effect of weed clipping on grain yield in the year of clipping was mixed, with higher yields from clipping at 2 of 4 sites. The effect of weed clipping on crop yield the year following clipping was mixed with higher yields for the clipped treatments at 2 of 4 sites.

Weed populations were dramatically reduced by weed clipping in 3 of 4 clipped sites in the year following clipping.

In conclusion, weed clipping can assist in reducing weed banks in soil and reducing weeds in the long term.

The swather and prototype flail chain system may also be an option in controlling weed population in organic crops.

A 42-page detailed report on organic weed clipping (Report #5199G) is available from PAMI. A shipping and handling charge will apply.

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