Proso Millet Harvest: A Comparision of Conventional Harvest and Direct Harvest with a Stripper Header.

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Can we use a stripper header to direct harvest proso millet?

FIGURE 1. Pros and cons associated with stripper harvest vs. conventional harvest

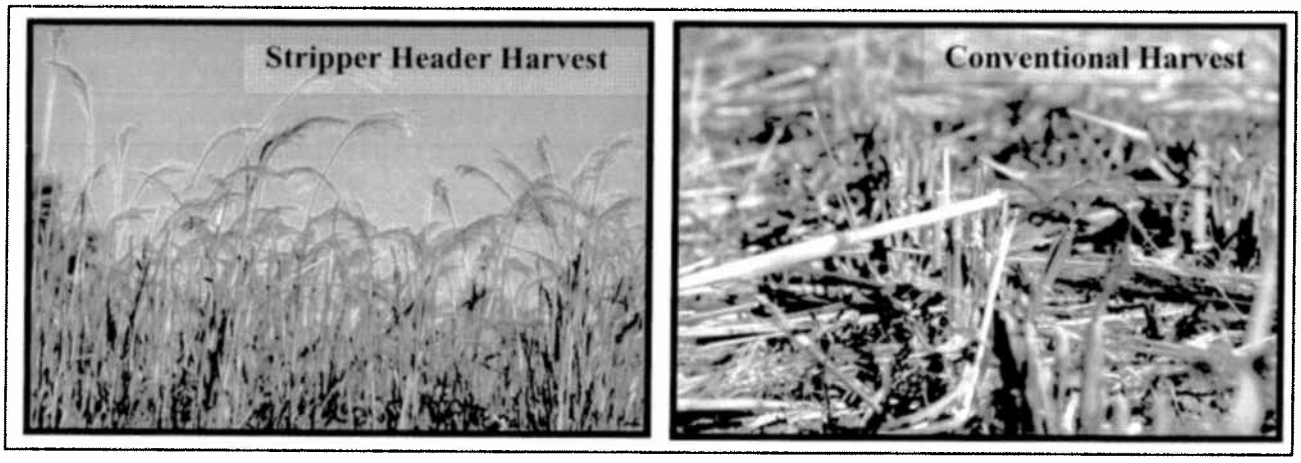
PROS

- Faster harvest (6 mph vs 3.5 mph)
- No swathing operation
- More standing residue to catch snow and stop wind erosion
- Less wear on combine (less biomass passing through
- Use stripper header for wheat and proso millet
- Potentially more residue to plant into for following crop

CONS

- Farmer stress while waiting for the proso millet to dry
- Cost of stripper header
- Danger of wind, snow, hail, or rain waiting for the proso millet to dry in the field
- Must harvest immediately once the proso millet dries down to an acceptable moisture (potential conflict with wheat planting)

FIGURE 2. Residue remaining following harvest.



Introduction

Increased residue is especially beneficial for dryland producers. Residue reduces soil erosion, increases snow accumulation (particularly standing residue), reduces moisture loss via evaporation, and increases soil water storage for the following crop. Fuel costs are increasing, and if it is possible to eliminate the swathing operation in harvesting proso millet without losing yield, this would save money for the producer. Conventional proso millet harvest includes a swathing operation that lays the proso millet down in wind rows and speeds up the drying process. Once dry, the proso millet is then harvested with a pickup head. Alternatively, with a stripper header, the proso millet dries while standing in the field, and is then harvested directly. Research has been conducted, and is currently ongoing, on the benefit of residue from stripper header harvested wheat on the following crop (Nielsen and Vigil); however, little is known about harvesting proso millet this way. With this in mind, our objectives were to: 1) compare harvest efficiency and 2) determine how much residue was left standing following each harvest technique.

Materials and Methods

A study was conducted at the Central Great Plains Research Station in Akron, Colorado in 2003 - 2005. Each of the three years, we selected a uniform area of proso millet and dedicated half of it to conventional harvest and the other half to stripper header harvest. We had at least three replications of each harvest technique every year and plots were randomized throughout the field.

For the conventional harvest, a 16 foot draper Hesston 8200 Swather was used to lay down the proso millet. A John Deere 9400 combine with a John Deere pickup head was used for conventional harvest. For the stripper header harvest, a John Deere 9400 combine with a Shelbourne CX 54 Stripper header was used to harvest the proso millet directly. Settings for both harvest methods are shown in Table 1.

TABLE 1. Equipment settings.

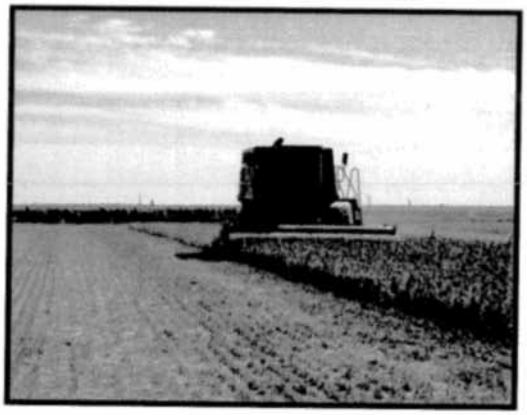
Harvest Technique	Ground Speed	Cylinder Speed	Concave Clearance
Conventional	3.5 (mph)	500 (rpm)	2.5 (mm)
Stripper	6 (mph)	500 (rpm)	3.0 (mm)

	Fan Speed	Chaffer Setting	Sieves
Conventional	950 (rpm)	10 (mm)	5 (mm)
Stripper	950 (rpm)	10 (mm)	5 (mm)

Table 1.
continued.

	Extension	Stripper Drum Speed	Cowling Setting
Conventional	10 (mm)	na	na
Stripper	10 (mm)	500 (rpm)	Green (up)

FIGURE 3. 2005 Harvesting proso millet with a stripper header.



Proso millet 'Earlybird' was planted in all three years of the study. This particular variety has a tendency to resist seed shattering. Planting date for all three years was approximately June 06. This date is slightly later than average for this region, but it is based upon previous research at the CGPRS station in Akron that suggests that with limited herbicide options to control grass weeds in crop, delaying proso millet planting date allows us to manage several flushes of grass weeds with a glyphosate burndown prior to planting. Weed control was a glyphosate burndown, followed by 2,4-D amine (1 pt) in 2003 and 2005, and 2,4-D amine (3/4 pt) plus carfentrazone (0.5 oz) (Aim) in 2004.

Results

As the price of diesel increases, eliminating the swathing operation becomes more appealing. Time in the field at harvest is reduced because the combine can go about twice as fast with the stripper header compared with the conventional pickup head (Table 1). Residue following a stripper header operation is, on average, about 18 inches tall compared with 5 inches tall for conventional harvest. Following stripper harvest, the orientation of the residue is standing in the field rather than laying on the field in pieces. In addition to increasing snow catch, the residue should be less likely to blow away or degrade, thereby increasing the residue profile for the next crop.

Over the three years of our study, yields appear to be neither improved nor reduced with respect to harvest technique (Table 2). This agrees with observations from the farm manager at the University of Nebraska High Plains Agricultural Laboratory, Mr. Tom Nightingale (pers. com), who has also used a stripper header to harvest proso millet from small acreages at their research facility near Sidney.

Although seed drop was a concern at the start of the study, we only noticed a slight increase in the number of seeds on the ground following stripper harvest (Table 3). We do not know if this was because of the stripper harvest itself, or seed drop associated

with wind/rain/hail while waiting for the seed heads to dry in the field. Pre-harvest seed counts in upcoming studies should address this issue.

TABLE 2. Proso millet yield data for 2003-05.

Year	Harvest Technique	Harvest Date	Moisture	Yield		
				Test Weight (lbs/bu)	Lbs / A	Bu / A
2003	Conventional	9/16/2003	10.8%	55.1	1900	**34**
2003	Stripper	9/22/2003	12.1%	55.8	2101	**38**
2004	Conventional	9/21/2004	12.8%	57.1	1412	**25**
2004	Stripper	9/20/2004	13.9%	56.8	1190	**21**
2005	Conventional	9/14/2005	10.7%	56.6	3155	**56**
2005	Stripper	9/20/2005	10.3%	56.4	3126	**55**

TABLE 3. Proso millet seed loss data for 2003-05.

Date	Harvest Technique	
	Conventional	Stripper
	Seed on Ground Before Harvest (ft^2)	
2003	34	33
2004	28	28
2005	30	30
Avg.	**31**	**30**
	Seed on Ground After Harvest	
2003	37	38
2004	33	34
2005	34	39
Avg.	**35**	**37**
	Seed on Ground Caused by Harvest	
	4.3	**6.8**

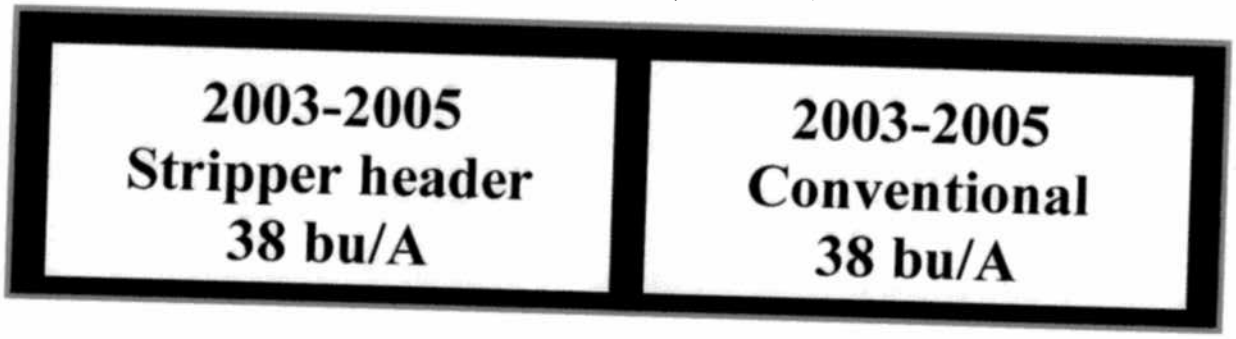
TABLE 4. Proso millet residue components with respect to harvest technique.

Year	Width	Height	Biomass on Ground	Standing Biomass	Total Biomass
	(mm)	(inches)	(lb/A)	(lb/A)	(lb/A)
			Conventional		
2003	3.65	6	1980	1070	3050
2004	3.47	5	1351	304	1655
2005	3.90	3	1468	314	1782
Avg	**3.67**	**5**	**1600**	**563**	**2162**
			Stripper		
2003	3.69	14	579	4111	4690
2004	3.20	22	1167	2028	3195
2005	3.73	17	879	1557	2436
Avg	**3.54**	**18**	**875**	**2565**	**3440**

Conclusions

These studies were conducted on relatively small plots (a couple of acres) and we were able to watch them closely to determine when they were dry enough to harvest. If a producer were to try this on a much larger scale, there could potentially be problems. Wind, hail and rain during the fall of the year pose significant risks. Swathed proso millet, can be negatively impacted by the elements, but probably not as much as proso standing in the field. Swathing represents a type of insurance for the producer. Once the proso is swathed, the producer, at his convenience, can wait until it dries out to go pick up the crop. If a producer has a small field of proso that he would have ready access to harvest once it dries down, a stripper header appears to be a viable option. Current research at the High Plains Agricultural Laboratory is assessing batch drying systems. The goal is to harvest the millet sooner and avoid some of the risks of leaving it stand in the field to dry.

FIGURE 4. Yield summary for 2003-2005 at Akron, Colorado.



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