YELLOWFEED PRODUCTION IN SASKATCHEWAN

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Summary
Yellowfeed is a method of harvesting forage where an annual cereal crop is sprayed with glyphosate at the milk-soft dough stage and allowed to stand until dry. Once the crop has dried, it is cut and baled immediately after cutting. After the application of glyphosate, dry matter yield increased for up to 20 days. In years when crop drying is delayed due to wet conditions, yield loss can occur after 20 days. After spraying, the percentage of protein decreased until day 21, and increased slightly thereafter. The percentage of total digestible nutrients was inconsistent with no significant change. Yellowfeed is a viable harvesting alternative when annual cereals are harvested for hay.

Introduction
Yellowfeed is the name given for a new alternative method of harvesting an annual cereal crop for hay. The traditional method of harvesting annual cereals for hay or greenfeed is to cut and crimp the crop at the milk-soft dough stage, and allow the material to dry in the windrow before baling. With yellowfeed, glyphosate is applied at the milk-soft dough stage and the crop is then allowed to stand until dry. Once dry, the crop can be cut and baled immediately following.

Advantages of yellowfeed are: eliminates weathering loss in the windrow during rainy conditions; eliminates the need to turn windrows after a rain; ability to schedule harvest (similar to silage); perennial weed control; crop can be cut with a swather rather than a haybine. Disadvantages of yellowfeed are: requires a high clearance sprayer; cost of glyphosate; no regrowth for fall grazing.

During 2001-2003, forage samples of oats and barley were collected to determine the effect of glyphosate on yield and quality. Yield and quality were monitored from the time of spraying until 1-2 weeks past the point of being dry enough to cut and bale immediately after. The rate of glyphosate used was 1 litre/acre.

Site Locations and Harvest Conditions
In 2001, oats samples were collected from four producer sites at Balcarres, Carievale, Corning, and Francis. Barley samples were collected from one producer site at Wawota. In 2002, oats samples were collected from two producer sites at Corning and Fillmore, and barley samples were collected from one producer site at Wawota. Also in 2002,

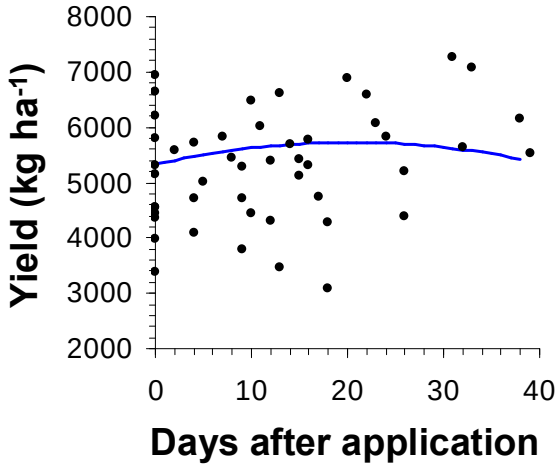
randomized replicated plots of oats and barley were sampled at the Southeast Research Farm Inc. at Redvers, and at Indian Head Agricultural Research Foundation. In 2003, oats and barley plots were seeded at Redvers and Indian Head.

In 2001 and 2003, there was no rain during the sampling period. The crops were generally dry enough to cut and bale by days 12-15. In 2002 there was an extended period of wet weather after the glyphosate was applied, and the crops required a much longer time to dry. In some cases, the crops were still not dry enough for baling 38 days after spraying.

Forage Yield

Graph 1 shows average dry matter yield increased 7.4% from the time of glyphosate application (5333 Kg/ha) to day 20 (5727 Kg/ha). This increase occurs because the crop continues to grow for a period of time after spraying. It should be noted in two of the three trial years, the crop was dry enough to cut and bale by days 12-15. From day 20 to day 38, average dry matter yield decreased (5429 kg/ha), statistically similar to the pre-glyphosate yield.

Graph 1. Change in dry matter yield after the application of glyphosate.



Forage Quality

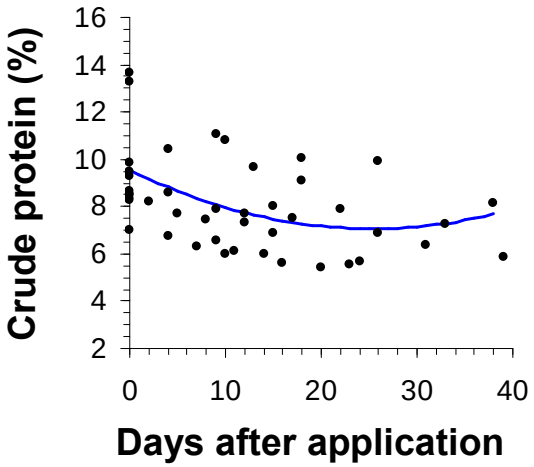
A. Crude Protein

Graph 2 shows average dry matter protein decreased from the time of glyphosate application (9.5%) to day 25 (7.1%). As explained above, the crops continued to grow for a period of time after the application of glyphosate. A decrease in total plant protein is normally expected from annual cereals as the crops continue to mature. In two years the crops were dry enough to cut and bale by days 12-15, with average protein at about 7.5%.

B. Total Digestible Nutrients (TDN)

Statistically, when averaged across years, percent TDN, ADF, and NDF did not change after the application of glyphosate. However, there was a slight trend based on weather conditions after spraying. During dry weather in 2001 and 2003, TDN either remained constant or increased. During prolonged wet weather in 2002, TDN remained constant or decreased.

Graph 2. Change in protein after the application of glyphosate.



Discussion

Yellowfeed appears to be a viable option for drying annual cereals prior to baling. The application of glyphosate does not cause a significant negative effect on forage yield or quality. Forage yield increases initially after spraying, likely due to the crop continuing to grow for a period of time after spraying. Protein percent declines after spraying. This is likely due to dilution from increased yield, and a normal decrease in protein level from later maturity. Overall TDN, ADF, and NDF remained constant.

Glyphosate products currently registered for pre-harvest use on livestock forage are Credit, Maverick, Vantage, Vantage Plus, Renegade, and Roundup.

After glyphosate is applied, barley dries about 4-7 days sooner than oats. Barley stands well after spraying, but the heads tend to curl over close to the soil surface when the crop is left standing after it has dried. Oats tends to lay over horizontally at about a 12-18 inch height. This does not interfere with cutting because the cutter bar can be set below this height. The leaves and kernels remain attached, even after the crop is left standing 7-10 days after dry.

Palatability of yellowfeed is reported as good. Most producers believe the palatability of yellowfeed is equal to or greater than regular greenfeed.

The economics of yellowfeed could be studied further. Economic analysis should consider: expected changes in forage yield and quality from spraying to harvest; cost of herbicide and application; cost of swathing compared to crimping; potential benefit of perennial weed control.

Greenfeed verses Yellowfeed

The traditional method of drying greenfeed prior to baling is to cut, crimp, and lay the material in a windrow. From the time of cutting until the crop is dry enough to bale, there are changes in forage yield and quality.

After a plant is cut, it continues to respire until it has dried to 40% moisture content. Respiration is a reaction where carbohydrates are converted to water, carbon dioxide, and heat. This process results in dry matter yield loss.

We cannot make a direct comparison between greenfeed and yellowfeed for changes in yield and quality during dry down. There is very little information on yield and quality changes in annual grass forages after cutting. However, there is information on the changes of yield and quality of perennial grasses after cutting.

Over a number of studies looking at perennial grasses, under good drying conditions, yield losses from cutting to dry down average 5% dry matter, with a range of 2-8%. The opposite occurred in yellowfeed, with a dry matter yield increase of 7.4% at 20 days after glyphosate application.

Under good drying conditions from cutting to dry down on perennial grasses, it was reported that protein can actually increase by 0.8 percentage points, while TDN decreases by 1.8 percentage points. In this yellowfeed study, the percentage of crude protein tended to drop 2.4 percentage points while there was no consistent trend for TDN. This suggests the yellowfeed dry down method may result in a higher yield and lower protein than greenfeed, when the crops are sprayed and cut at the same stage of development.

With traditional greenfeed harvesting, when rain occurs during the drying process, **further yield and quality losses will occur in addition to the normal respiration losses.** The level of these losses is related to moisture content of the crop when it rains, amount of rain, duration of rain, and drying conditions after the rain.

From research reported on perennial grasses, a rain of 25 mm (1 inch) can cause an increased yield loss of 8% dry matter, with a range of 4-14%. Protein and TDN will decrease by 1.3 and 3.0 percentage points respectively. A rain of 50 mm can cause an increased yield loss of 15% dry matter, with a range of 8-27%. Protein and TDN will decrease by 2.7 and 6.0 percentage points respectively. These losses were not observed for yellowfeed in 2002, when significant rainfall and humid weather occurred after glyphosate application. From this trial, it appears forage yield and quality with yellowfeed would be less adversely affected than greenfeed under poor drying conditions.

Research comparing losses between these two drying methods for annual forage grasses would increase our confidence in comparing changes in yield and quality between the two harvesting systems.

Conclusion

Yellowfeed is a viable harvesting method that should be considered by forage producers in Saskatchewan.

Acknowledgements

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