



Is Swine Manure Injection into Alfalfa Stands a Good Idea?

The hog industry is growing on the Canadian prairies as demand for pork increases worldwide. The expansion of the hog industry has created a demand for suitable locations for barns where there is land available for hog manure application. Farmers require access to manure management practices that will allow them to add value to their hog production enterprises in an environmentally sustainable way. The application of hog manure is not only a logistical problem that must be addressed, but also an opportunity for producers to utilize a valuable fertilizer resource.



Measuring the depth of injection.

Saskatchewan Agriculture and Food - Agriculture Development Fund provided funding for PAMI to investigate the effect of low disturbance swine manure injection on the yield and quality of alfalfa stands. Injection of swine manure into alfalfa produced for

dehydration (pelleting) was undertaken as both a research and demonstration initiative. In this project, PAMI partnered with the Soil Science Department - University of Saskatchewan, Kapt-AI Services Ltd., and farmer co-operators Don Squires and Clarence Mitchell.

At a Glance

Shallow injected swine manure can increase the forage yield of alfalfa if the soil is nutrient deficient. Injection of swine manure is particularly effective when phosphorus, potassium, and sulfur are deficient. Yield increases up to 45 per cent occurred on the test plots and forage protein levels also increased. In contrast, yield

decreases can occur due to crop damage by injection when soil nutrient levels are adequate. Farmers who have liquid manure to utilize should soil test their alfalfa fields prior to low disturbance swine manure injection to ensure that the manure application will be beneficial.

What We Did: Alfalfa Trials



Figure 1. Greentrac Injecting into First Year Alfalfa.

Using a Greentrac manure injection machine (Figure 1), PAMI injected two sites (Star City and Valparaiso) that were in dehy alfalfa production in the Tidsdale, Saskatchewan area. Both sites were seeded to alfalfa in the fall of 1997 on canola stubble. The alfalfa was at the seedling stage when injected in May of 1998 (year 1), and was injected again in May, 1999 (year 2). In year 3, the treatments were applied in the fall of 1999 using PAMI’s modified low disturbance manure injector.

At each location, the swine manure was injected into 10 ft x 100 ft (3 m x 31 m) plots. Swine manure was injected to specific plots at an application rate of 3,300 imperial gallons/acre (gpa) (37,000 litres per hectare (L/ha)) all three years; other plots were injected at a rate of 6,700 gpa (75,000 L/ha) in year 1 and 3; and a third set of plots was injected at a rate of 13,300 gpa (150,000 L/ha) which was applied only in year 1.

Two checks were included in the plots; an unworked check, and a check plot where the Greentrac or PAMI injector was operated with the coulters at standard operating depth, but with no swine manure application.

Soil samples were taken before and after injection at 0 - 12 in (0 - 30 cm) depth and analyzed for nitrogen (N), potassium (P), phosphorus (K), and sulphur (S).

A small plot harvester was used to take harvest samples on two separate cutting dates. Kapt-Al Services Ltd. analyzed the harvest samples.

PAMI wishes to thank the Agriculture Development Fund of Saskatchewan Agriculture and Food for its support in making this project possible.

The Results

Star City Site - Nutrient Deficient

Table 1. Three Year Total Alfalfa Yields.

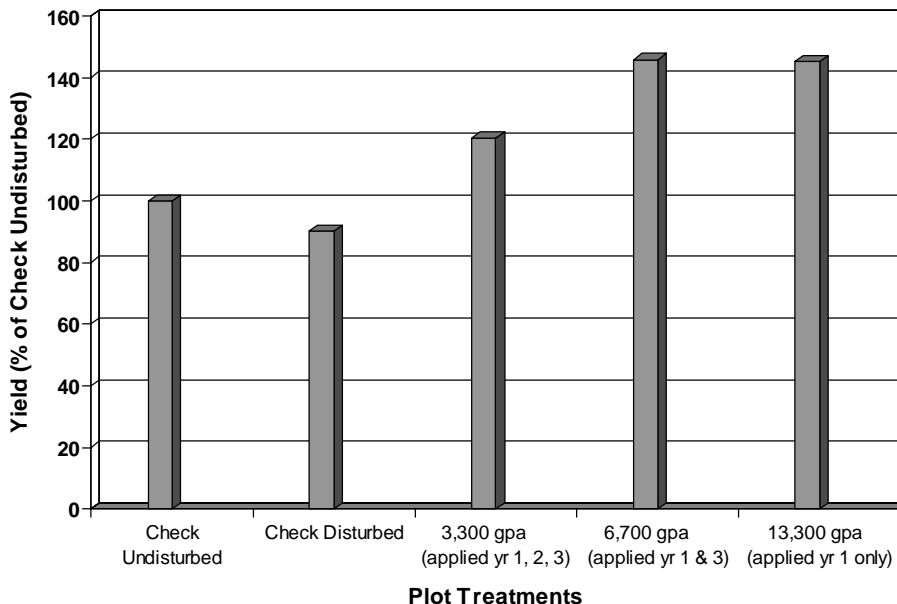
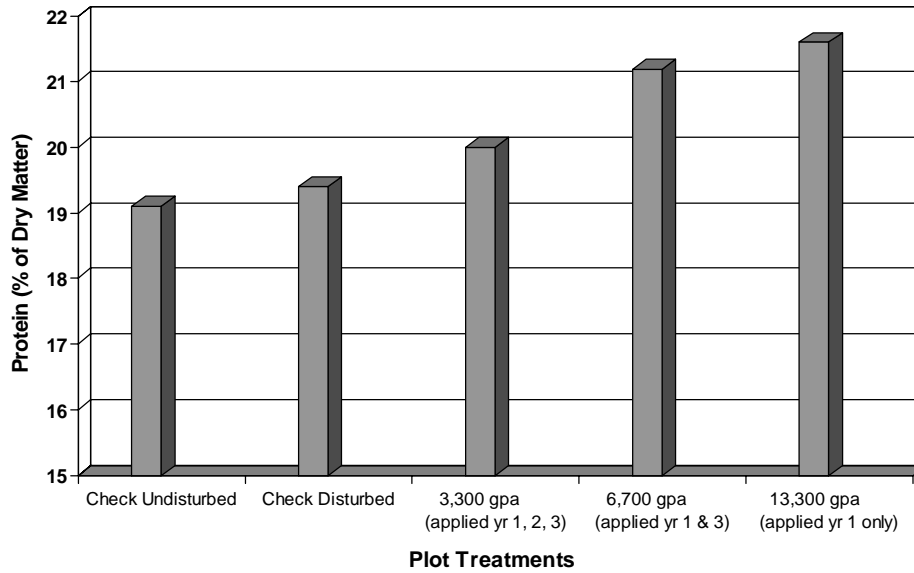


Table 2. Three Year Average Forage Protein.



Valparaiso Site - Not Nutrient Deficient

Table 3. Three Year Total Alfalfa Yields.

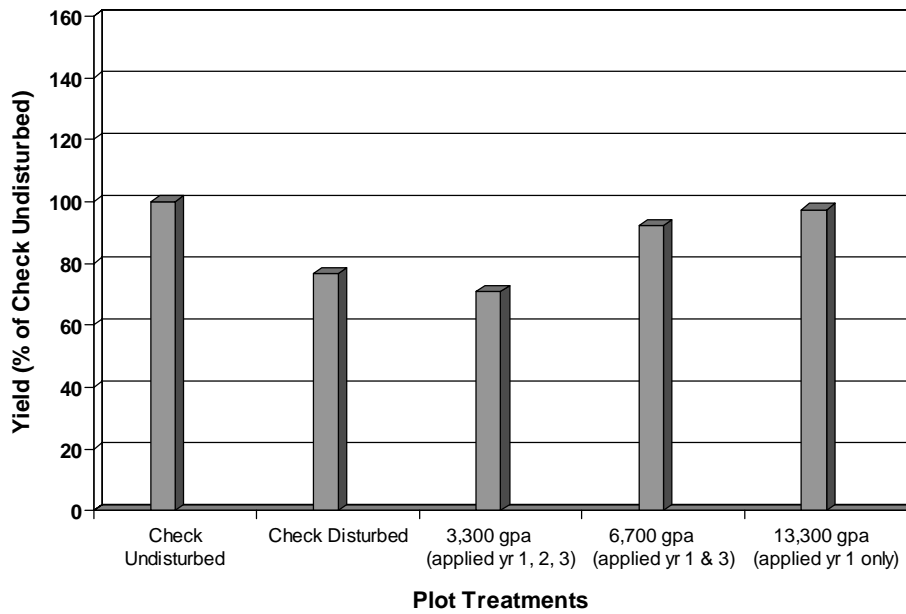
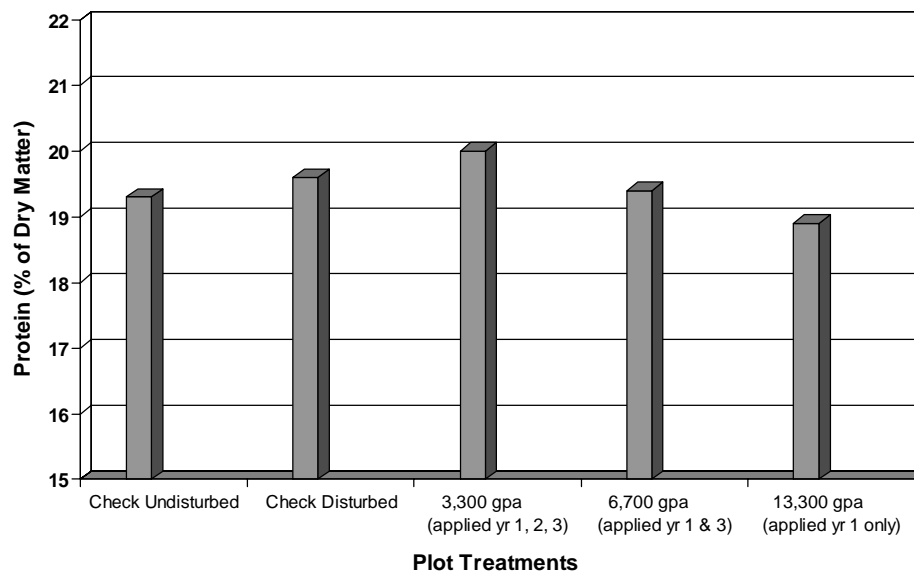


Table 4. Three Year Average Forage Protein.



PAMI's research indicates that the injection of swine manure into established stands of alfalfa will increase yields when there is a nutrient deficiency. The research shows that phosphorus, potassium, and sulfur are growth-limiting factors that could be corrected with swine manure injection. Tables 3 and 4 show that at the Valparaiso site where there was not a significant nutrient deficiency, the yield and protein quality were not improved by the injection of swine manure. Tables 1 and 2 show that at the Star City site where there was a nutrient deficiency that the swine manure injection helped to increase yield and protein quality.

The Greentrac machine was used in year 1 and year 2. In year 3, the Greentrac was replaced with the PAMI low disturbance injector system. The PAMI system has excellent coulters depth penetration, and was available because it was being tested in the area. The new coulters-type injector developed by PAMI, as part of an Agricultural Development Fund project, had modified Bourgault mid-row banders that were capable of 5-inch (13 cm) injection depths (Figure 2). The equipment modifications included stronger springs, and adding weight to the injection toolbar. The deeper injection furrows resulted in improved injection performance with no slurry visible in the furrows at the 3,300 gpa (37,000 L/ha) rate. At the 6,700 gpa (75,000 L/ha) rate, injection performance was lower with slurry showing on 5% of the surface outside the furrow.

It should be noted that the Greentrac coulters injector was not designed for dry, prairie conditions, and its



Figure 2. Injection Slot in First Year Alfalfa.

performance limitations under the dryland forage conditions should not be considered a criticism of the product. The Greentrac is a manure injection machine built in Ireland and widely used in Europe for grassland injection. In other projects, the Greentrac is being used successfully to inject swine manure into pasture and forage land.

Recommendations

Depth penetration of the manure injection system is important because there is a direct correlation between the depth of the injection slot and the injection performance. The deeper the injection depth (i.e. 5 inches versus 2 inches (13 cm versus 5 cm)) the better the injection performance. This is due to the fact that the deeper injection slot gives more furrow area to take up the liquid manure. This decreases surface pooling and thus odor and nutrient loss.

There appears to be less damage caused to the alfalfa stand when low disturbance swine manure application is undertaken in the fall. This may be attributed to the dormant condition of the plants at this time of year.

Since low disturbance manure injection systems do result in root damage to alfalfa stands, farmers should weigh the benefits of application against the costs involved before proceeding. The injection process does reduce forage yields over the short-term, but the alfalfa plants recover from the mechanical damage and respond with increased yields (38%) when nutrient deficiencies are present prior to injection. Farmers should also soil test to check if there is a nutrient deficiency in phosphorus, potassium, or sulphur. Note that a deficiency in nitrogen is not a factor for healthy alfalfa stands. If the alfalfa has adequate nutrients for growth, the injection of liquid swine manure may not result in a yield or quality increase and may in fact result in a yield decrease. However, injection of swine manure into established forage stands can provide a benefit if there is an existing nutrient deficiency.

The detailed engineering report 0198G, *Low Disturbance Injection of Swine Manure into Alfalfa Produced for Dehy*, is available. There is a shipping and handling charge to obtain this report. You can call 1-800-567-7264 for more details.



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