

Using Cranberry Presscake as a Soil Amendment

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Cranberry presscake is a food processing residual with low pH and high carbon to nitrogen ratio. Research in 1991 was conducted with the assistance and cooperation of Ocean Spray Inc.

Field experiments were established to examine the feasibility of utilizing the cranberry presscake as a soil amendment in tilled agricultural soils in Massachusetts. Land application of cranberry presscake is being investigated so farmers and industry (Ocean Spray Inc.) can be assured that it is justified, both economically and environmentally. Field studies included the effect of nitrogen fertilizer on cranberry presscake decomposition in soil and yield of oat, the effect of acidity from cranberry presscake on establishment and yield of alfalfa, the effect of the rate of presscake application on field corn production and the characteristics of cranberry presscake as a mulching material.

Corn - Cranberry Presscake/Celite Field Study.

Corn is grown on more annually tilled acres than any other annual crop in Massachusetts, and represents potentially the greatest cropped area for applying cranberry presscake as a soil amendment. The experiment examined three factors for the interaction of a presscake/celite mixture with addition of lime and nitrogen fertilizer. The presscake/celite rate varied from 0 to 50 ton/acre, nitrogen from 50 to 300 lb/acre and lime from 0 to 2000 lb/acre.

The experimental area had an initial soil pH of 6.7. The average pH of the presscake/celite mixture was 4.01. The pH of the presscake component in the mixture was 3.62. The presscake/celite mixture, lime and half of the nitrogen was spread on the plots and incorporated on May 16, 1991. The remaining nitrogen fertilizer was spread on plots on June 24, 1991. Corn was planted May 17, 1991. Soil samples were taken from each plot 2½ weeks after planting and again after harvest to determine the effect of the presscake/celite mixture on soil pH. Figure 1 shows results from plots which received varying rates of presscake/celite, 1000 lbs. of lime and 200 lbs./acre of nitrogen fertilizer. Soil pH was depressed from 6.7 to 5.5 with increasing rate of cranberry. Soil pH had recovered to 6.0 at the high presscake rate 5 months later in October.

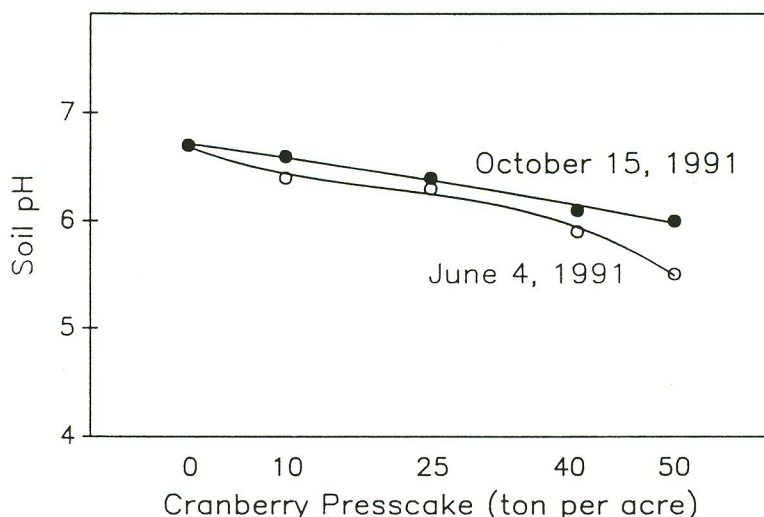


Figure 1. Soil pH after incorporating varying rates of a presscake/celite May 16, 1991.

Silage and earcorn yields did not change significantly (Statistical Probability, $P > 0.05$) with applications of cranberry, lime or nitrogen fertilizer. Also there were no significant interactions among these factors. The previous crop on the experimental site was lupin, a grain legume. Nitrogen added from the incorporation of this crop would account for the lack of a nitrogen yield response. Nitrogen deficiency was apparent in the corn plants on a check plot which received no nitrogen and had not grown the previous lupin crop. Lack of a nitrogen response in the main experiment is similar to what might be found on many dairy farm soils where there has been a history of manure application.

Alfalfa - Cranberry Presscake Field Study.

In the alfalfa study two rates of presscake (0, 34 ton/ac) were combined with three rates of lime (0, 1000, 2000 lb/ac). Alfalfa was chosen because it is an important crop on dairy farms in rotation with corn, and because it is sensitive to soil acidity when pH drops below 6.0. Presscake was applied to plots May 2, 1991 and incorporated by disking May 3, 1991. Alfalfa was seeded with a brillon seeder May 9, 1991.

Alfalfa and weed emergence and establishment were delayed in presscake plots. This can be seen from plant sample data collected on June 27, 1991 (Figure 2). Since alfalfa does not perform well at pH levels below 6.0, low pH could have been a contributing factor influencing alfalfa establishment. However, there were similar effects on weeds which are not affected by low pH as much as alfalfa. Plots receiving presscake visually appeared dryer than plots without presscake. During the early growth period there was little rainfall, hence induced moisture stress may also have been a factor.

The first harvest after establishment was taken on July 11, 1991 and the second on September 3, 1991. Both harvests showed significantly lower ($P < 0.0001$) plant growth in presscake plots but there was more recovery of alfalfa in the second harvest (Figure 3). There was no interaction between cranberry presscake treatments and lime rate, and addition of lime did not affect yield. The lack of an immediate lime response can be expected since lime reacts slowly in the soil. Figure 1 illustrated that plots receiving 1000 lbs. lime/acre showed some recovery in pH after several months. However, if presscake application resulted in reduced establishment then a later rise in pH would not increase alfalfa plant number.

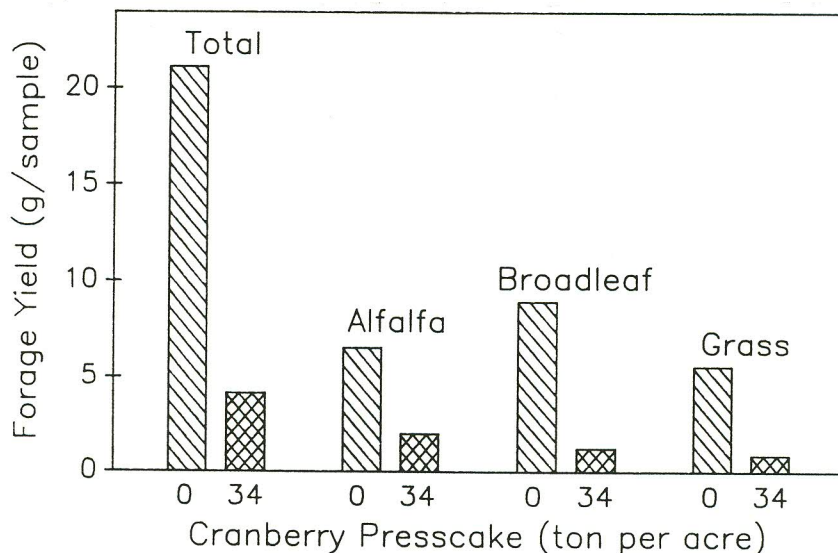


Figure 2. Alfalfa and weed growth in plots with varying rates of presscake.

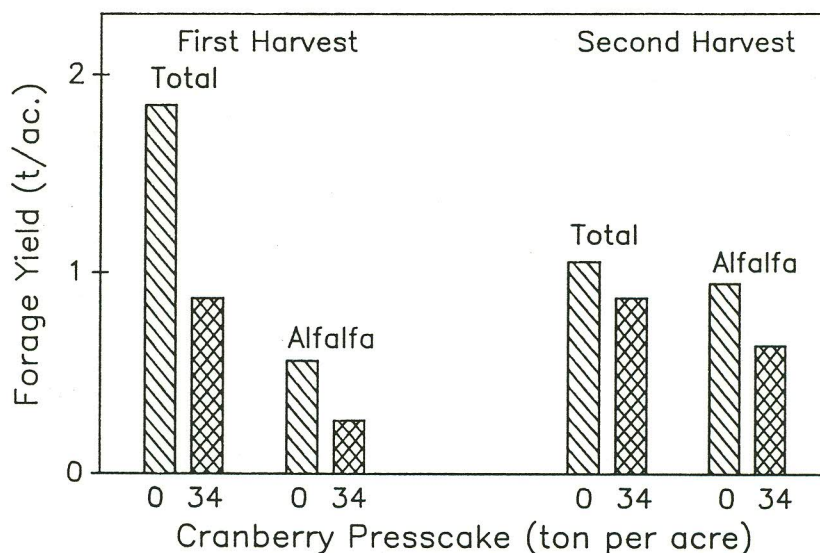


Figure 3. Yield of alfalfa and alfalfa plus weeds for first and second harvests in 1991.

Initial Perspectives and Research Implemented in 1992

After only one year of experimentation and it is too early to report definitive results. However, prospects for the application of the presscake/celite mixture appear promising for corn given that there was no yield reduction the first year. Lime added at planting, although it had little immediate benefit, is expected to raise the pH after the initial depression by addition of the cranberry residual. Soils have been sampled this spring to determine subsequent pH changes. Even though corn was able to tolerate the pH depression this first year, we still need to determine what might happen after multiple applications. Thus the cranberry presscake/celite mixture was applied to the same plots in 1992 and will be in 1993.

The lower yield of alfalfa following addition of presscake is a concern. Alfalfa crops are typically rotated with corn on the same fields. Thus a farmer could be limited to planting corn after spreading presscake, when because of animal feed requirements he might rather or need to plant alfalfa. The alfalfa study also demonstrated a reduction in weed growth after soil incorporation of presscake. This might be exploited by some farmers. Weed suppression was also evident in another mulching study similar to other surface mulching materials. With additional funding through the University of Massachusetts we have initiated several field and greenhouse studies examining potential allelopathic and weed suppression effects.