
Is the yield potential of alfalfa increasing?

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The relationship between alfalfa breeding efforts and yield potential is complicated. While most literature on annual grain crops shows yield improvements with the release of new varieties over time, a literature search on alfalfa yield will show improvement, stagnation, and declines, depending on the paper. One of the latest attempts to discern what is really going on comes from Lei Ren and colleagues out of the University of Saskatchewan.

Ren and colleagues summarized data from the Western Forage Variety Testing System from 1997 to 2011 to see how breeding has changed the yield potential of alfalfa varieties over time. They recognized that environmental conditions and harvest management are factors that can affect alfalfa yield that are not always included in reviews on this topic. Since the prairies receive significantly less annual precipitation than Ontario, the data from the irrigated sites in the Western Forage Variety Testing System are of particular interest in eastern Canada.

The researchers found no significant trends between forage yield and the year a variety was released when they examined the data from irrigated sites for varieties released between 1997 and 2011. There was also no significant improvement in regrowth for second cut. However, when they restricted their analysis to varieties released between 2000 and 2011, second cut yields and total yields (first plus second cut) improved about 1% per year across the two irrigated sites. This stronger regrowth could be the result of reduced fall dormancy in newer varieties.

In addition, the cumulative temperature above 5°C from April to June had a significant impact on alfalfa yield at the irrigated sites. This makes sense, since growing degree day models (Base 5°C) can predict alfalfa development with reasonable accuracy. Warmer temperatures above 5°C would speed up alfalfa development in the spring and allow for more first cut growth. The amount of precipitation between April and June at rain-fed sites had a significant impact on yield. This trend was not apparent at the irrigated sites because water was not limiting in those plots.

The irrigated sites had a more aggressive cutting schedule (three cuts/year) than many of the rain-fed trial locations (one to three cuts/year). Trial data showed that yields from stands that were harvested more frequently were not as affected by precipitation during the growing season. The researchers attributed this to reduced vigour because of stress from frequent cutting. A weakened plant with a reduced root system is less able to take advantage of moisture following a rain. Increased snow cover during the winter increased alfalfa yield on the irrigated sites. While it is known that snow cover helps protect alfalfa crowns from cold injury, this relationship may be more significant when the plants are stressed from aggressive cutting schedules.

It is worth keeping in mind that the variety trial sites all have good soil fertility to support alfalfa production. Any responses to limited or unbalanced nutrition will not be apparent from this data set. How different varieties cope with nutritional stresses is another management factor that could influence alfalfa yield.

Other work on this topic can provide more context for the inconsistent conclusions around alfalfa breeding and yield potential. In a field study from 1999 to 2003, Lamb and colleagues assessed the yield of alfalfa varieties released between 1940 to 1995. Plots were established in Wisconsin, Ohio, Minnesota, and Iowa. While the sites in

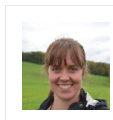
Minnesota and Iowa showed little yield advantage to using newer varieties, there was a significant yield difference between older and newer varieties in Ohio and Wisconsin. Stand persistence was also significantly better for newer varieties in these states. This was attributed to the improved disease resistance in newer varieties and the environmental conditions in Ohio and Wisconsin that increased disease pressure.

With environmental factors playing such a strong role in the yield potential of alfalfa, there is not a universal answer to whether breeding has improved alfalfa yields. In addition, alfalfa breeders have selected for multiple traits – such as winterhardiness, yield, persistence, and quality – simultaneously, even though these traits sometimes work against one another. Right now, it is only when growing conditions allow improved traits to shine that genetic advancements appear in the yield data. However, in wetter environments like Ontario's, newer varieties show improved regrowth and disease resistance. Both traits contribute to higher yields and persistence. Therefore, Ontario producers can benefit from growing newer varieties on their operations. Purchasing certified seed ensures that desirable traits are present in the alfalfa to be seeded on the farm.

References

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