

7-27-2012

# Phosphorus and Potassium in Silage Harvest of Drought-Damaged Corn

John E. Sawyer

*Iowa State University*, [jsawyer@iastate.edu](mailto:jsawyer@iastate.edu)

Antonio P. Mallarino

*Iowa State University*, [apmallar@iastate.edu](mailto:apmallar@iastate.edu)

Follow this and additional works at: <http://lib.dr.iastate.edu/cropnews>

 Part of the [Agricultural Science Commons](#), [Agriculture Commons](#), and the [Agronomy and Crop Sciences Commons](#)

---

## Recommended Citation

Sawyer, John E. and Mallarino, Antonio P., "Phosphorus and Potassium in Silage Harvest of Drought-Damaged Corn" (2012).  
*Integrated Crop Management News*. 151.  
<http://lib.dr.iastate.edu/cropnews/151>

**The Iowa State University Digital Repository provides access to Integrated Crop Management News for historical purposes only. Users are hereby notified that the content may be inaccurate, out of date, incomplete and/or may not meet the needs and requirements of the user. Users should make their own assessment of the information and whether it is suitable for their intended purpose. For current information on integrated crop management from Iowa State University Extension and Outreach, please visit <https://crops.extension.iastate.edu/>.**

---

# Phosphorus and Potassium in Silage Harvest of Drought-Damaged Corn

## **Abstract**

The dry conditions this summer are resulting in quite variable corn growth and production potential. Some livestock producers are beginning harvest of corn damaged by drought conditions for silage. Corn silage harvest results in more phosphorus (P) and potassium (K) removal than grain alone because almost the entire plant is harvested. The increased amount removed with silage differs for P and K because the relative amount of P and K is different in corn vegetative parts than in grain. For P there can be approximately four times greater amount of P per ton of dry matter in grain than vegetative parts, but for K the opposite occurs, on average with almost three times greater amount of K per ton of dry matter in the vegetative parts.

## **Keywords**

Agronomy

## **Disciplines**

Agricultural Science | Agriculture | Agronomy and Crop Sciences

[ICM Home](#)[ISU Extension Calendar](#)[Publications](#)[Extension News](#)[County Offices](#)[Contact Us](#)  
[Subscribe to Crop News](#)

#### Archives

[2014](#)[2013](#)[2012](#)[2011](#)[2010](#)[2009](#)[2008](#)[Previous Years](#)

#### ISU Crop Resources

[Extension Field Agronomists](#)[Crop & Soils Info](#)[Pesticide Applicator Training](#)[Agronomy Extension](#)[Entomology Extension](#)[Plant Pathology Extension](#)[Ag and Biosystems Engineering Extension](#)[Agribusiness Education Program](#)[Iowa Grain Quality Initiative](#)[College of Agriculture and Life Sciences](#)[ISU Extension](#)

## Integrated Crop Management NEWS

[PRINT STORY](#)  
[EMAIL STORY](#)  
[ADD TO DELICIOUS](#)  
[ATOM FEED](#)  
[FOLLOW ON TWITTER](#)

### Phosphorus and Potassium in Silage Harvest of Drought-Damaged Corn

By John Sawyer and Antonio P. Mallarino, Department of Agronomy

The dry conditions this summer are resulting in quite variable corn growth and production potential. Some livestock producers are beginning harvest of corn damaged by drought conditions for silage. Corn silage harvest results in more phosphorus (P) and potassium (K) removal than grain alone because almost the entire plant is harvested. The increased amount removed with silage differs for P and K because the relative amount of P and K is different in corn vegetative parts than in grain. For P there can be approximately four times greater amount of P per ton of dry matter in grain than vegetative parts, but for K the opposite occurs, on average with almost three times greater amount of K per ton of dry matter in the vegetative parts.

The easiest approach for estimating P and K removal with silage harvest is to use existing estimates of the average corn silage removal amounts per unit of yield. From the ISU Extension and Outreach publication PM 1688 (A general guide for crop nutrient and limestone recommendations in Iowa), those values are 3.5 lb P<sub>2</sub>O<sub>5</sub>/ton and 8.0 lb K<sub>2</sub>O/ton (65 percent moisture based). On a dry matter basis, the values are 10 lb P<sub>2</sub>O<sub>5</sub>/ton and 23 lb K<sub>2</sub>O/ton. Of course the total removal amount per acre will vary according to the amount of silage harvested. These average concentration values could be correct with drought-damaged corn if the plant vegetation and grain are roughly affected in equal proportion.

However, drought conditions complicate estimates of P and K removal with silage harvested early because of largely unpredictable effects on dry matter production and nutrient uptake and accumulation. Depending on how moisture availability was during the season, there could be relatively more or less dry matter production than nutrient uptake, which would result in lower or higher concentration values, respectively. Data is very limited, however. Results from research in Kansas showed the nitrogen (N), P, and sulfur (S) concentrations were about the same for normal or drought-stressed corn, but the K concentration increased by about 50 percent.

An additional consideration is the growth stage of the corn when it is harvested. If the corn has not matured normally, but instead is harvested early or dies due to lack of moisture and high temperatures, it may really only be at an R1 (silking), R2 (blister), R3 (milk) or R4 (dough) growth stage at the time of silage harvest. In those cases, the full time period for nutrient uptake has not occurred and, in addition, the dry conditions could further reduce uptake. For each of those stages, and assuming little to no grain production, then the percent of normal full vegetative P and K uptake are for P: R1 50, R2 55, R3 55, R4 55 percent; and for K R1 75, R2 85, R3 85, R4 85 percent (adapted from ISU Extension and Outreach publication PMR 1009, Corn growth and development). Therefore, depending on the timing of the drought, the effects on P or K accumulation in the plant could differ greatly. Vegetative P and K concentration normally decrease as grain fill occurs due to translocation to grain, but that will be limited or non-existent in situations with

little to no grain. One could multiply the percentage for the appropriate harvest growth stage by the normal P and K removal values for silage to estimate P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O amount per ton silage when there is little or no grain. For example, if silage is harvested at a R3 growth stage, then an estimated amount per ton silage (dry matter based) would be 10 x 0.55 = 5.5 lb P<sub>2</sub>O<sub>5</sub>/ton and 23 x 0.85 = 20 lb K<sub>2</sub>O/ton.

Because of the great deal of uncertainty, a more accurate estimate of P and K removal can be obtained by sending silage samples to a laboratory for analysis. The Iowa State University Soil and Plant Analysis Laboratory and all private laboratories are equipped to analyze plant tissue for P, K and other nutrients. You need to be sure the sample is representative by making a composite sample from material taken from different silage loads.

No matter the method used to estimate silage P and K concentration, the amount of silage harvested per acre has the greatest impact on nutrient removal. Therefore, it is important to have a good estimate of silage harvested and the moisture content.

For P and K, even if estimates of removal with silage harvest are off somewhat, soil sampling and testing in the fall can help with longer-term management in drought-affected fields. In extreme cases where no or very limited crop is harvested, then P and K will recycle from plants and be available for the next crop.

*John Sawyer and Antonio P. Mallarino are professors in the Department of Agronomy with research and extension responsibilities in soil fertility and nutrient management. They can be contacted at [jsawyer@iastate.edu](mailto:jsawyer@iastate.edu) and [apmallar@iastate.edu](mailto:apmallar@iastate.edu).*

---

This article was published originally on 7/27/2012. The information contained within the article may or may not be up to date depending on when you are accessing the information.

---

Links to this material are strongly encouraged. This article may be republished without further permission if it is published as written and includes credit to the author, Integrated Crop Management News and Iowa State University Extension. Prior permission from the author is required if this article is republished in any other manner.