

MINERAL CONTENT OF MAIZE CROPS GROWN FOR SILAGE PRODUCTION

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Maize silage is a valuable forage resource combining high yield with high metabolisable energy content, although crude protein content is low. Overseas data indicate that maize silage may also be low in some minerals, so the present study was conducted to assess typical mineral content in maize crops in NSW and their adequacy for beef and dairy production.

Over three years whole plant maize samples were taken from 50 crops grown on NSW dairy farms in coastal districts from Kyogle (north) to Bodalla (south) including the Hunter Valley ($n = 42$), and in the inland dairying districts in the Murrumbidgee and Murray valleys ($n = 8$). The coastal crops were mostly dryland with limited supplementary irrigation, while inland crops were all irrigated. Bundles of 12 plants were cut from three or four sites in each crop within a few days of harvesting for silage. Whole plant samples were shredded and mixed thoroughly before sampling for chemical analyses. Samples were dried for 24 hours at 80°C and ground through a 1 mm screen prior to analysis for cations and phosphorus. The results are compared to NRC (1996) data for USA maize silages in Table 1.

Table 1. Mineral composition of forage maize and the quantities of minerals removed per hectare of crop on dairy farms in NSW

Mineral	NRC (1996)	Content in crop ($n = 50$)		Removed per ha crop ($n = 43$)	
		Range	Mean $\pm$ s.d.	Range	Mean $\pm$ s.d.
	(g/kg DM)	(g/kg DM)	(g/kg DM)	(kg/ha)	(kg/ha)
Calcium (Ca)	2.5	0.7 - 3.4	1.6 $\pm$ 0.44	6 - 66	26 $\pm$ 14.0
Phosphorus (P)	2.2	1.3 - 2.4	1.8 $\pm$ 0.29	6 - 65	29 $\pm$ 13.3
Magnesium (Mg)	1.8	1.0 - 2.7	1.7 $\pm$ 0.40	6 - 69	28 $\pm$ 13.4
Sodium (Na)	0.1	<0.1 - 0.5	0.2 $\pm$ 0.12	<1 - 9	2 $\pm$ 1.9
Potassium (K)	11.4	5.6 - 18.2	9.8 $\pm$ 2.92	28 - 401	159 $\pm$ 86.0
	(mg/kg DM)	(mg/kg DM)	(mg/kg DM)	(g/ha)	(g/ha)
Copper (Cu)	4	1 - 8	4 $\pm$ 1.5	10 - 199	70 $\pm$ 42.3
Zinc (Zn)	18	19 - 331	93 $\pm$ 67.9	174 - 7696	1720 $\pm$ 1671.9
Manganese (Mn)	24	18 - 159	48 $\pm$ 25.9	179 - 3765	800 $\pm$ 600.3
Iron (Fe)	131	53 - 195	105 $\pm$ 34.3	366 - 3941	1690 $\pm$ 855.5

The crops contained 345 g DM/kg fresh crop, 400 g grain/kg DM and 63 g crude protein/kg DM. Compared to NRC values, mean Ca content was lower and Zn and Mn contents were higher. The higher Zn content may reflect the fact that most of the crops were grown on acidic soils that are likely to promote greater Zn uptake by maize crops. Where feedlot and dairy waste are applied to maize crops, environmental concerns have generated interest in nutrient removal per hectare of crop. Although the mean crop yield was not high (16.3 $\pm$ 6.88 t DM/ha), there was significant removal of K, P, Ca and Mg highlighting the need to apply adequate K and P for crop growth. The removal of cations by regular cropping with maize could also lead to soil acidification. It is estimated that 386 kg lime/ha would be required to neutralise the acidifying effects of the observed mean removal of organic anions associated with Ca, Mg and K (K. Helyar, pers. comm.).

When maize silage comprises a significant proportion of the diet for growing or lactating cattle it is likely that supplementation with Ca, Na and Cu will be required. Given the higher Zn and Mn content observed here when compared to USA values, Zn or Mn deficiency is less likely but should be monitored.

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NRC (1996). 'Nutrient Requirements of Beef Cattle', 7th revised ed. (National Academy Press: Washington, D.C.)