

METALOSATE[®] TRIAL TO CONTROL TIPBURN IN ROMAINE LETTUCE

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Abstract

Romaine lettuce is a high-value crop in Denmark. This lettuce variety is very difficult to grow because it is very prone to internal tipburn. Many growers would like to grow romaine lettuce because it has a big potential for both home-sale and export.



Figure 1. Romaine Lettuce

The lettuce trials started in the beginning of 2003. The first trial was remarkable because the lettuce treated with Metalosate[®] Calcium and Metalosate Boron had no tipburn at all. The plant analysis indicated a very high level of boron. Therefore, all the following trials were conducted with a lower concentration of boron. The concentration of calcium was more or less the same in all the trials. It has not been possible to repeat the results from the first trial. Tipburn has been significantly reduced in all the trials but not totally eliminated. The conclusion is, therefore, that the levels of boron in the leaves probably have to be higher than we expect to avoid tipburn. Calcium and boron deficiencies exhibit the same symptoms of tipburn.

Purpose

The purpose with the trial was to prevent tipburn in romaine lettuce. The lettuce was grown together with the production plants to ensure optimal climatic conditions.

Trial Plan

The lettuce was treated when the plants had 4-5 rosette leaves. At harvest the lettuce was too big and it should have been harvested the week before.

Dosage: 2 litres/hectare (27 fluid ounces/acre) Metalosate Calcium plus
0.25 litres/hectare (3.4 fluid ounces/acre) Metalosate Boron

Planted: July 25, 2003 (week 29)

Treated: August 14, 2003 (week 33)
August 21, 2003 (week 34)
August 28, 2003 (week 35)

Harvest: September 3, 2003 (week 36)

Results

Treatments	Top + Root	Top	Root	Root/Top
Untreated	0.252 ns	0.129	0.123 ns	0.967*
Calcium + Boron	0.265 ns	0.145***	0.120 ns	0.894

Statistic: ANOVA

This is the first romaine lettuce trial where the root to top relationship is lower for the treated lettuce than for the untreated. The root to top ratio was 0.9 in the treated and 1.0 in the untreated. The optimal root to top ratio to avoid tipburn is approximately 1.2.

In this trial the tops of the treated plants were significant bigger than the tops of the untreated ones.

Treatment	Total No. of Plants	Plants with Tipburn	Percentage with Tipburn
Untreated	30	16	53
Calcium + Boron	30	8*	27

The calcium plus boron treatments had significant fewer lettuce heads with tipburn at a 5% level of confidence ($p = 0.033$).

The tipburn incidence in the plants was minimal (see Figure 2). There was a sign of tipburn on a single leaf. The cells had collapsed but rot had not yet developed.

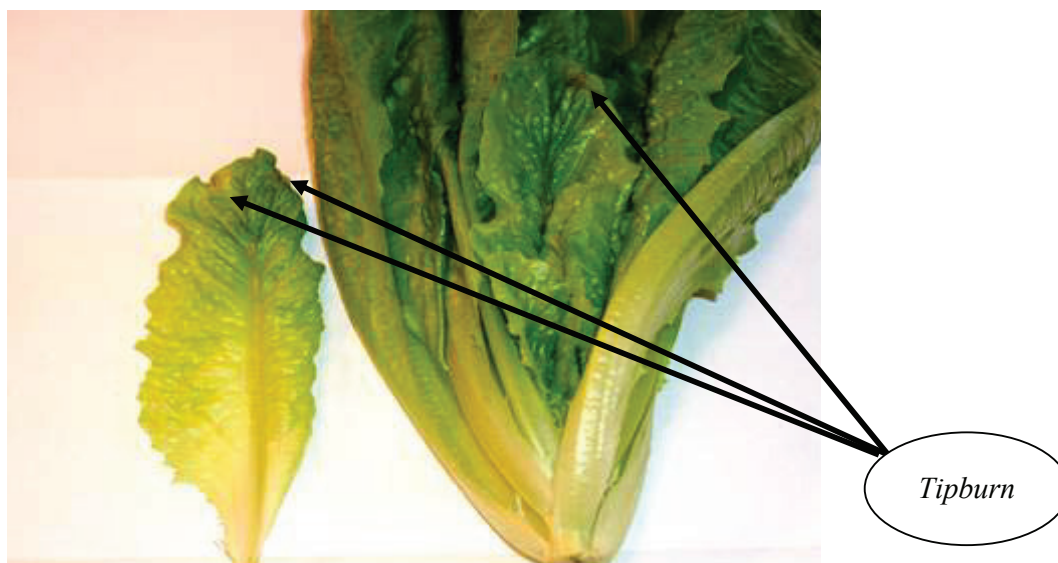


Figure 2. Tipburn Symptoms in Romaine Lettuce.

Table 3				
Nutrient Analysis and T.E.A.M. Indexes				
	Untreated		Calcium + Boron	
	Analysis	Index	Analysis	Index
N	5.8	17	5.9	17
S	0.26	-21	0.26	-23
P	0.83	42	0.86	44
K	5.25	18	6.07	37
Mg	0.44	4	0.37	-8
Ca	1.10	-24	0.95	-34
Fe	84	-19	100	-18
Mn	100	11	84	-4
B	28	-23	43	-3
Cu	7	-11	8	-5
Zn	42	5	40	-1

Deficient
Very Low
Low
Optimum
High
Very High
Excessive

The content of calcium is less in the treated plants than in the untreated plants. This result was not expected. The content of boron in the treated plants increased as expected.

Table 4 indicates that the content of both calcium and boron has a meaning for the development of tipburn. The only trial where the plants did not develop tipburn had a content of boron above 100 ppm. The content of boron should probably be higher than 40 ppm to avoid tipburn.

Table 4				
Content of Calcium and Boron in Three Romaine Lettuce Trials				
Metalosate Treatment	Date	Calcium (ppm)	Boron (ppm)	Tipburn (%)
Calcium + Boron	29 Jan 03	1.18	118	0.0
Untreated	29 Jan 03	0.96	41	57.0
Calcium + Boron	15 Apr 03	0.73	25	34.4
Untreated	15 Apr 03	0.80	39	93.3
Calcium + Boron	3 Sep03	0.95	43	27.0
Untreated	3 Sep 03	1.10	28	53.0

Conclusion

Tipburn in this trial likely developed around harvest. This might have been avoided with a late treatment just prior to harvest. These results also indicate that the level of boron should be higher in the plants.