

Enzymatic browning of potatoes is greatly reduced with organic fertilization compared to mineral fertilization

Joachim Raupp¹

Institute for Biodynamic Research, Brandschneise 5; D-64295 Darmstadt (Germany)

e-mail: raupp@ibdf.de

Keywords: manure, potatoes, food quality, degradation test

Introduction

Enzymatic browning of tubers owing to mechanical injury is generally considered to indicate poor quality, mainly for visual reasons. It is very low or even entirely absent in healthy, uninjured tubers. Browning is also a serious problem during potato processing. Whether the type of fertilizer affects the degree of browning was investigated over a three-year period in a field trial with organic and mineral fertilization.

Materials and methods

A field trial was launched in 1980 to compare composted cattle manure in 2 treatments with and without application of biodynamic preparations and mineral fertilization, each at 3 levels corresponding to 0.9, 1.4 and 1.8 livestock units per hectare. The site conditions are: latitude 49° N, longitude 8° E; 100 m above sea level, annual averages 9.5°C air temperature and 590 mm precipitation; sandy orthic luvisol. Extract darkening was determined according to Pettersson (1970). Tubers were cut and squeezed out. The extract was diluted 1:30, extinction was measured at 400 nm for two days at 2-3 dates during the storage period from autumn to spring.

Results and discussion

The extract of organically fertilized tubers had a lower extinction than the tubers produced with mineral treatments (see Table 1 as an example). This difference occurred immediately at the beginning of the test with the fresh extract as well as during the following two days, when darkening continued with all samples, but to different extents. While increasing manure levels reduced browning, higher amounts of mineral fertilizer intensified the dark colour. During storage from October to April, extinction showed no clear tendency. Polynomial regressions were calculated for the extinction values during the two days after production of the extracts. The R² values decreased during storage from 0.95 - 0.98 in November to 0.80 - 0.91 in next February. This may be interpreted as an indication of progressing disintegration. Similar results were obtained in the three years 1997, 1998 and 1999.

Table 1: Extinction of fresh potato extract (E0), after 24 and 48 hours (E24, E48) with composted manure (CM), manure with biodynamic preparations (CMBD) and with mineral fertilization (MIN), evaluated in November 1999

	Type	Level			Av.
		1	2	3	
E0	MIN	0.49	0.53	0.54	0.52 *
	CM	0.49	0.47	0.46	0.47 *
	CMBD	0.47	0.45	0.45	0.46 *
	Av.	0.48	0.48	0.48	
E24	MIN	0.56	0.60	0.61	0.59 *
	CM	0.54	0.49	0.47	0.50 *
	CMBD	0.54	0.47	0.44	0.48 *
	Av.	0.55*	0.52*	0.51*	
E48	MIN	0.84	0.90	0.89	0.88 *
	CM	0.87	0.76	0.68	0.77 *
	CMBD	0.77	0.66	0.69	0.71 *
	Av.	0.83 *	0.77 *	0.75 *	* = p<0.05

Conclusion

The results confirm the positive effects on food quality of organic as compared to mineral fertilization. Darkening of potato extracts may be used for quality assessment, as this parameter reflects directly the physiological condition of a sample.

Reference

Pettersson, B.D. (1970). Verkan av växtplats, gödning och tillväxtreglerande substanser på matpotatisens kvalitetsegenskaper. Nordisk forskningsring Meddelande Nr. 23