

# Effect of Fertileader® Vital on green pea maturation

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**Summary:** The changes of tenderness of three green pea varieties with different maturity were studied after Fertileader® Vital fertilizer treatment. The fertilizer treatment caused significant differences in the tenderness of treated plants in every year. After the second measuring time; the treated plants showed better quality than the control ones. The treated varieties kept their tenderness longer due to this foliar fertilizer, the yield have better quality so even better suited to the requirement of canning industry. Use of Fertileader® Vital is of an economic importance because high economic benefit can be realized in one hectare after Fertileader® Vital treatment. By using this foliar fertilizer 12,840 HUF extra profits can be realized by producing green peas of I. quality class instead of yield with II. quality category. This extra profit could increase to 447,840 HUF considering that green peas belong still to the II. quality class after fertilizer treatment when the quality of non-treated plants are no more suitable for the canning industry.

**Key words:** tenderness, *Pisum sativum* L., quality, biostimulator

## Introduction

Tenderness of green pea is one of the most important qualitative traits for processing industry. There are green pea varieties which pass the tenderness within one day, and there are varieties which can keep the good quality for several days. The major aspect in determining the date of harvest of green peas is the tenderness (Everaarts & Sukkel, 2000; Fallon et al., 2006). There are two possibilities to measure the maturity: tenderometer degree (T°) and finometer degree (F°). The freezing industry use tenderometer degree, while the canning industry uses finometer degree. According to the quality three classes are determined by the canning industry: (1) F° up to 45 – excellent; (2) F° from 45.1 to 55 – I. class; (3) F° from 55.1 to 65 – II. class (Nagy, 2000).

Primary aim of our three-year experiment was to study the changes of tenderness during the green maturation after Fertileader® Vital fertilizer treatment. The Fertileader® Vital is a biostimulator and contains algae extract. The content of Fertileader® Vital is a business secret. According to earlier (not published) observations we supposed that this foliar fertilizer can control the maturity, so its use can insure the maintenance of high quality of green pea for a longer time.

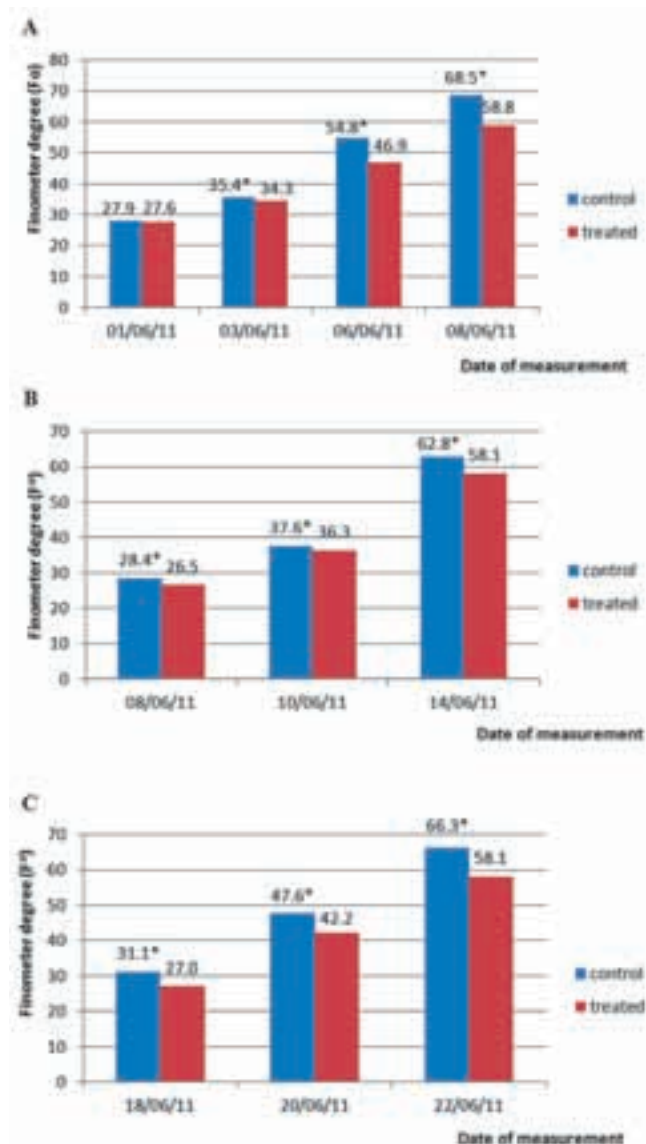
## Material and methods

The experiment was carried out at the Research Institute of Nyíregyháza from 2011 jointly with the Timac Agro Hungaria Ltd. Three green pea varieties were studied – bred in the

Research Institute – from different maturity group: ‘Léda’ (super early), ‘Zita’ (middle-early), ‘Zsuzsi’ (late), in randomized block in four repetition. The Fertileader® Vital was sprinkled at 10% flowering of green pea plants. The experimental area was not irrigated. The harvest was started on green maturation and it was repeated every two or three day. Seven measurements of tenderness were made from the harvested seeds in every variety and repetition by using finometer measuring instrument and it was determined in finometer degree (F°). The differences in the tenderness between the control and treated plants were determined by SPSS 13.0 for Windows.

## Results

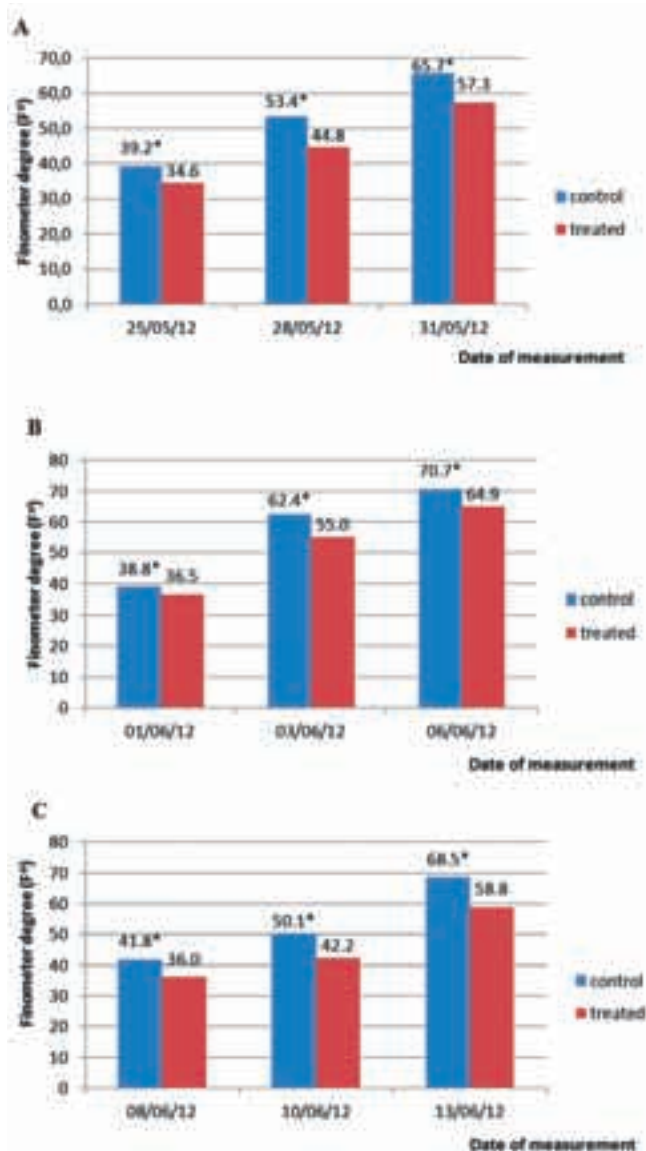
There were significant differences between tenderness of the control and the treated plants in every variety. Figure 1. shows the changes of the tenderness in the treated and control (without any treatment) plants in 2011. At the first measuring time there were differences between the control and treated plants, but the difference was not significant in ‘Léda’. The circled area shows the quality differences. In ‘Léda’ at the last measuring time the quality of the treated plants belonged to the II. category, while the quality of the control plants was no more suitable for the processing industry (out of categories). There were also quality differences in ‘Zsuzsi’ after the first measuring time. The tenderness of treated plants – in the second measuring time – was 42.2 F°, which belonged to the excellent category; while the tenderness of control plants was 47.6 F° which belonged to the I. class. The quality of the treated plants (58.8 F°, which belonged to the II. class)



**Figure 1.** Changes of the tenderness of different green pea varieties in 2011. A: 'Léda' B: 'Zita' C: 'Zsuzsi'. \* significant differences ( $P<0.05$ ); e: excellent, I.: First class, II.: Second class, n: outside of class (not suitable for the canning industry)

was better also at the last measuring time. The quality of the control plants was not suitable for the processing industry ( $68.5 F^{\circ}$ ), similarly to 'Léda'.

We could find significant differences between treated and control plants in every variety and every measuring time also in 2012 and also in 2013 (Figure 2, 3). However the differences were always significant between the control and treated plants the quality of the treated plants remained after the second measuring time. The tenderness values of the treated plants belonged to the excellent category in 'Léda' ( $44.8 F^{\circ}$ ) and 'Zsuzsi' ( $42.2 F^{\circ}$ ) at the second measuring time, while in the control plants had I. class quality. The same was true at the third measuring time in all the varieties: the treated plants belonged to the II. quality category which is still suitable for the canning industry while the controls were out from all the quality categories of the canning industry.



**Figure 2.** Changes of the tenderness of different green pea varieties in 2012. A: 'Léda' B: 'Zita' C: 'Zsuzsi'. \* significant differences ( $P<0.05$ ); e: excellent, I.: First class, II.: Second class, n: outside of class (not suitable for the canning industry)

## Conclusion

According to our three-year experiment the use of the Fertileader® Vital foliar fertilizer extends the maturity of the green pea (Table 1). This effect did not depend on the maturation type of the varieties, the significant differences were observed in each variety.

**Table 1.** Length of the maturation

Varieties	Control	Treated
'Léda' (super early)	5–6 days	8–9 days
'Zita' (mid-early)	5 days	7 days
'Zsuzsi' (late)	4–5 days	6–7 days

**Table 2.** Economic benefit (net prices) of using Fertileader® Vital (calculated for 1 hectare)

Quality categories	Income from 1 hectare* (HUF/kg)		Income without Fertileader® Vital (HUF)	Income with Fertileader® Vital (HUF)	Extra costs** (HUF)	Available extra profit (HUF)
	I. class	II. class				
I. class – II. class	485,000	460,000	460,000	485,000	12,160	12,840
II. class – out of class***	–	460,000	–	460,000		447,840

\* assuming 5t/ha yield

\*\* cost of Fertileader® Vital: 7660 HUF + cost of mechanical work: 4500 HUF (according to the Hungarian Institute of Agricultural Engineering, Gödöllő)

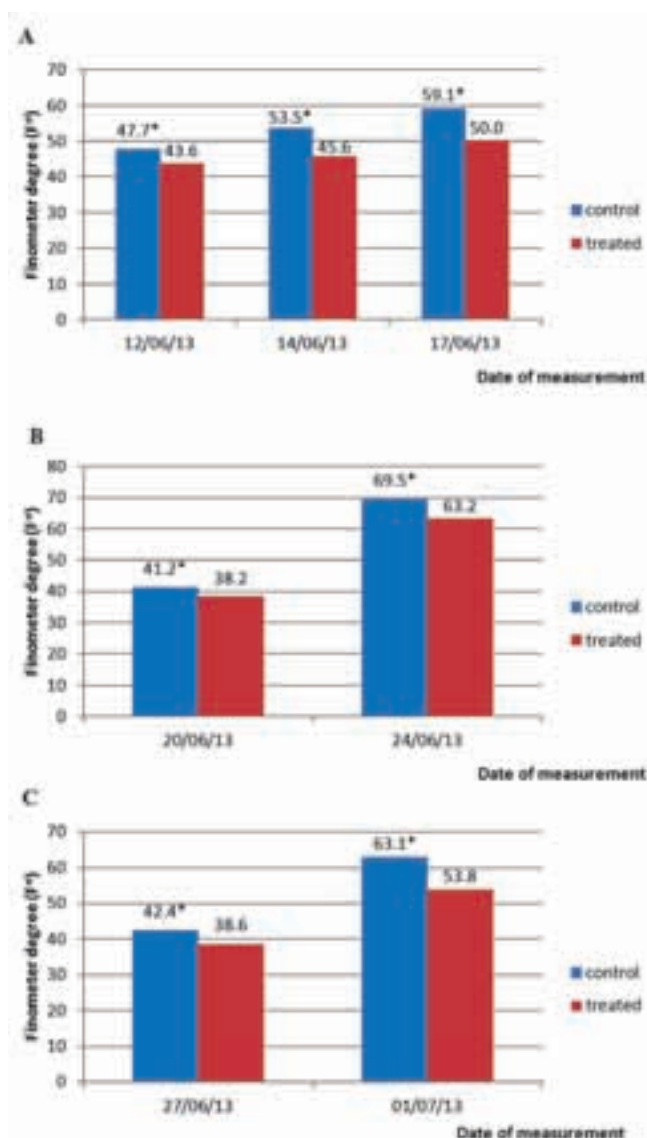
\*\*\* not delivered by the canning industry

The use of this fertilizer is of practical importance because the treated varieties kept their tenderness longer so the period of harvest of high quality yield can be extended.

It has economic benefit (Table 2) mainly at the end of the harvest of green peas when the quality of the treated plants belongs to the II. class while the control plants are out of

all categories. The use of Fertileader® Vital denotes 7660 HUF/hectare + VAT extra cost in the green pea fields. The delivery fees of the canning industry are 97 HUF/kg+VAT for the I. class of green pea and 92 HUF/kg+VAT for the II. class of green pea. These fees were given by the Bonduelle and respect to 2013. They do not work with excellent quality.

We got 12,840 HUF extra profits from the comparison of costs and incomes of the yield with either I. or II. quality class. Higher extra profits – 447,840 HUF – can be obtained comparing the costs and incomes of the yield with II. class and the not suitable quality peas. The total growing costs of green peas (Table 3.) were calculated as 250,590 HUF per hectare.



**Figure 3.** Changes of the tenderness of different green pea varieties in 2013. A: 'Léda' B: 'Zita' C: 'Zsuzsi'. \* significant differences (P<0.05); e: excellent, I.: First class, II.: Second class, n: outside of class (not suitable for the canning industry)

**Table 3.** Total cost of green pea growing (material and mechanical costs and calculated for 1 hectare in net cost)

Works	Costs (net, HUF)	
Material costs*	120,000	chemical fertilizer, pest, weed, disease control
Mechanical costs**	117,490	from sowing to harvesting
Total:	237,490	
+ seed transfer	13,100	calculated for 5 t/ha, 20 km (131 HUF/tkm)
<b>Total:</b>	<b>250,590</b>	

\* according to data of the Research Institute

\*\* according to the Hungarian Institute of Agricultural Engineering, Gödöllő

## Acknowledgement

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