Effect of agronomic factors on invert sugar accumulation in sugar beet

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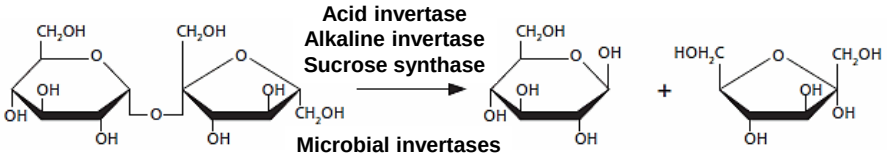
Introduction

Invert sugar formation in sugar beet:

cleavage of sucrose by sucrolytic enzymes



Sucrose **Glucose** **Fructose**

Why important?

- derived from sugar → sugar loss
- undesired coloration and reduction of alkalinity reserve of factory juices
- indicator for increased levels of other undesired beet constituents (e.g. dextran, mannitol, raffinose)
- increased consumption of processing aids and energy and reduction of sugar yield

IRS

Analysis of invert sugar

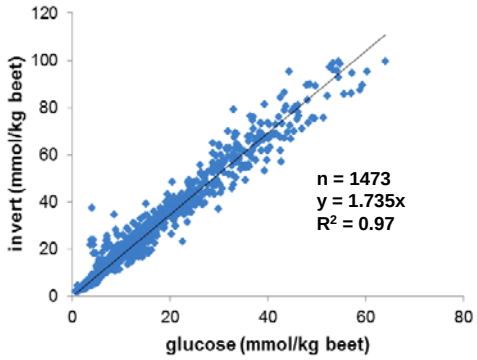
Analysis of glucose content using a biosensor

Integrated in Dutch tarehouses since 2013

IRS

Analysis of invert sugar

- calculation of invert sugar from glucose content
- since campaign 2013/2014 routinely measured in all beet samples in The Netherlands and reported to growers; not (yet) in beet payment system



Source: IRS Annual Report 2013

IRS

Factors affecting invert sugar content in sugar beet and control measures to minimize invert sugar accumulation

IRS

Deterioration after frost

Importance:

★★★★

Control:

timely frost protection

IRS

Storage conditions

Importance:

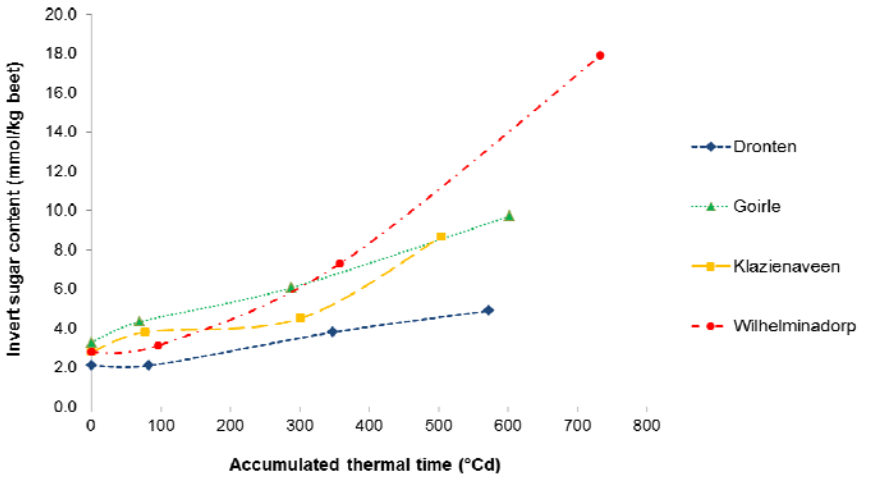
★★★★

Control:

- **clamp management**
- **dry storage**
- **temperature control**

IRS

Invert sugar vs degree days



Source: IRS storage trials, 2013

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Root and crown rot

Importance:

★★★☆

Control:

right resistances / tolerances and agricultural practices

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Heavily damaged beet and mould infestation

Importance:

★★★☆

Control:

beet friendly harvesting and handling

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Presence of green material

Importance:

★★☆☆

Control:

correct defoliation/topping at harvest

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Variety

Importance:

★☆☆☆

Control:

variety choice

(currently no information available on variety list)

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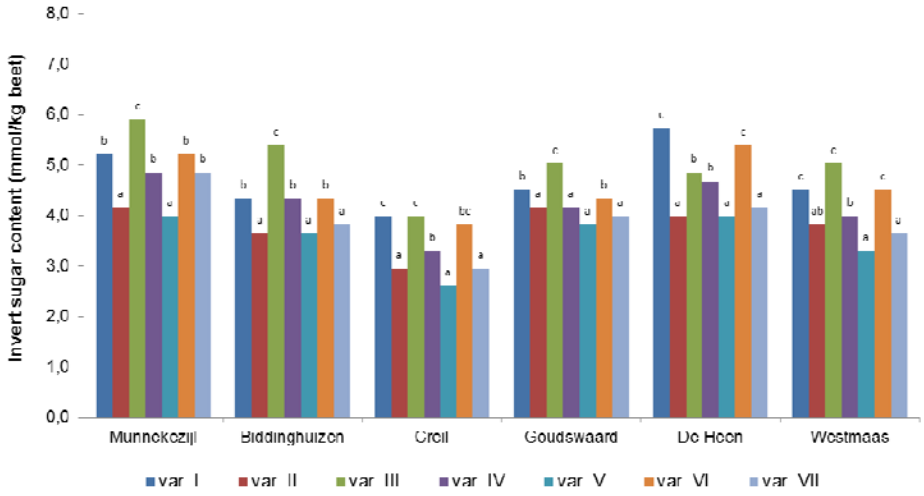
Commercial variety differences



lsd 5% = 0.48

Source: IRS variety trials, NL, 2014

IRS

Other agronomic factors

e.g. drought stress, rhizomania, verticillium, nutrient deficiencies, foliar diseases

Importance:

☆☆☆☆

(to be confirmed)

Control:

right agricultural practices and resistances/tolerances

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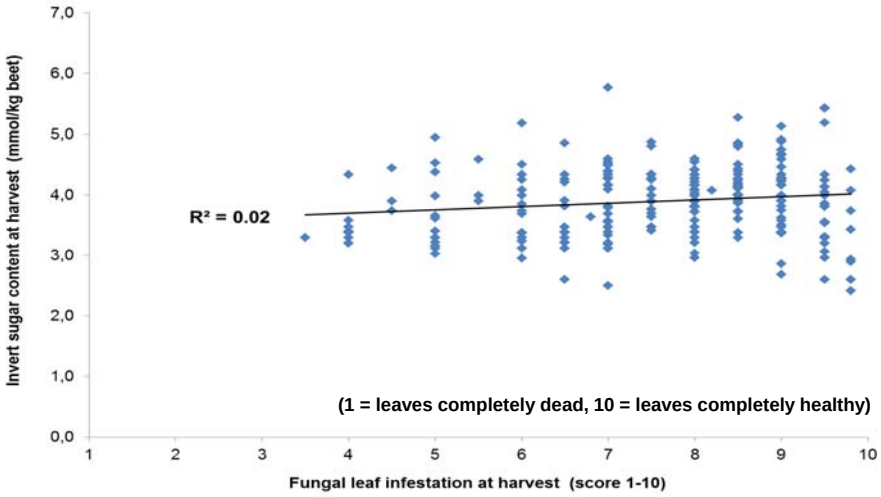
Fungal leaf infestation at harvest



Source: IRS fungicide field trials, NL, 2015

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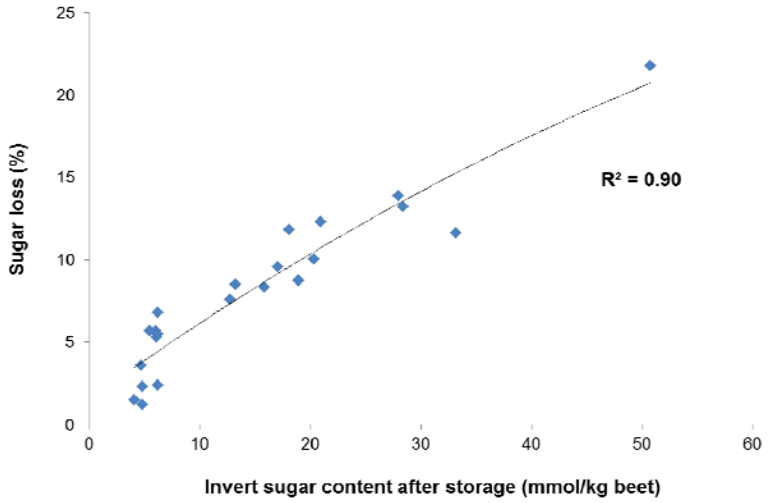
Invert sugar after storage vs. sugar loss



Source: IRS storage trials, NL, 2014

Conclusions

- **minimize invert sugar content to maintain acceptable technological quality of beet and low sugar losses**
- **growers are able to realize this by:**
  - **choosing the right agricultural practices and varieties**
  - **delivering good harvesting quality with minimal beet damage, green material and soil tare**
  - **paying attention to storage conditions**
- **including invert sugar in beet quality analysis provides valuable additional insight for beet growers into their delivered beet quality**

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