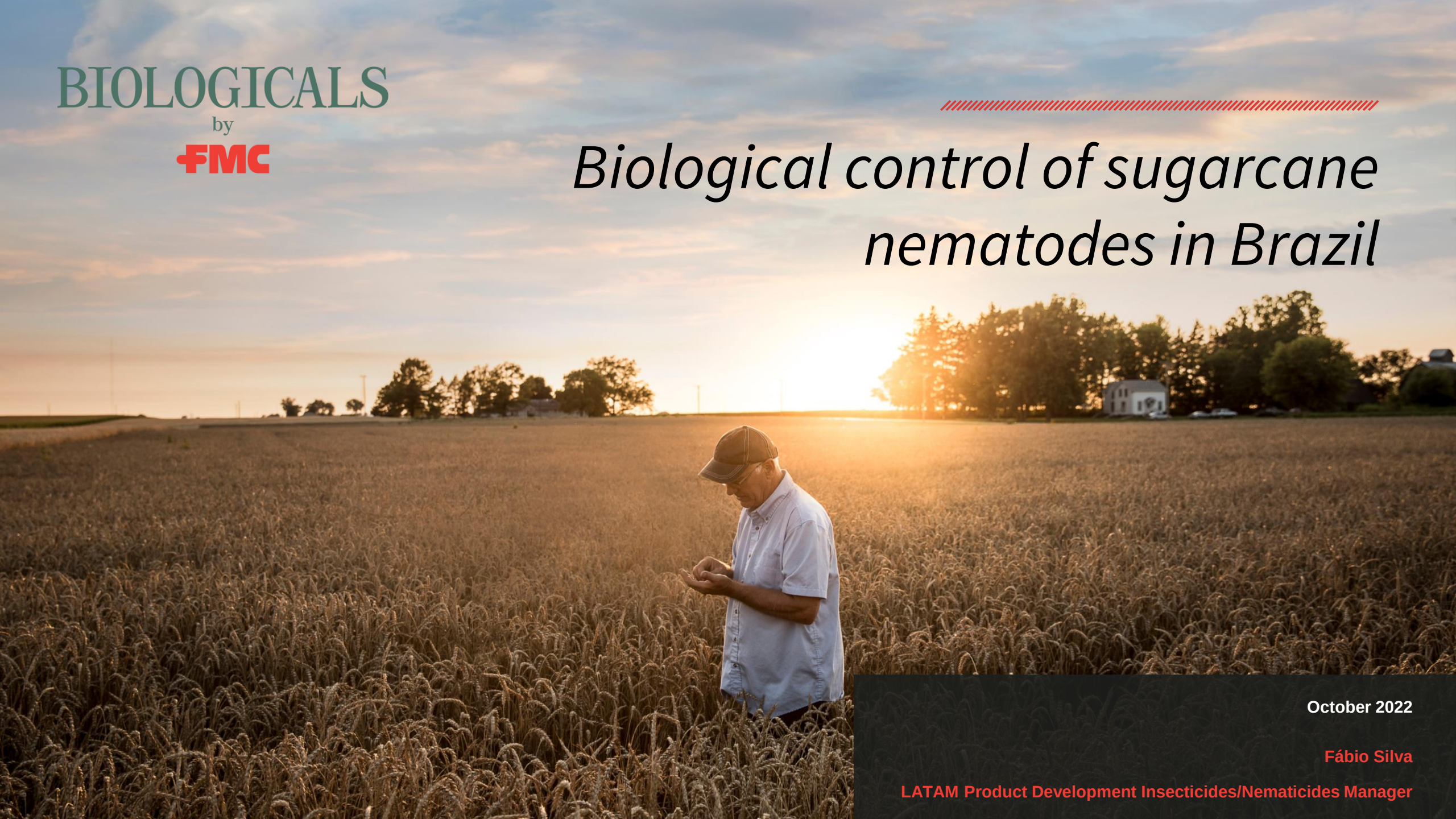
BIOLOGICALS
by
FMC

Biological control of sugarcane nematodes in Brazil



October 2022

Fábio Silva

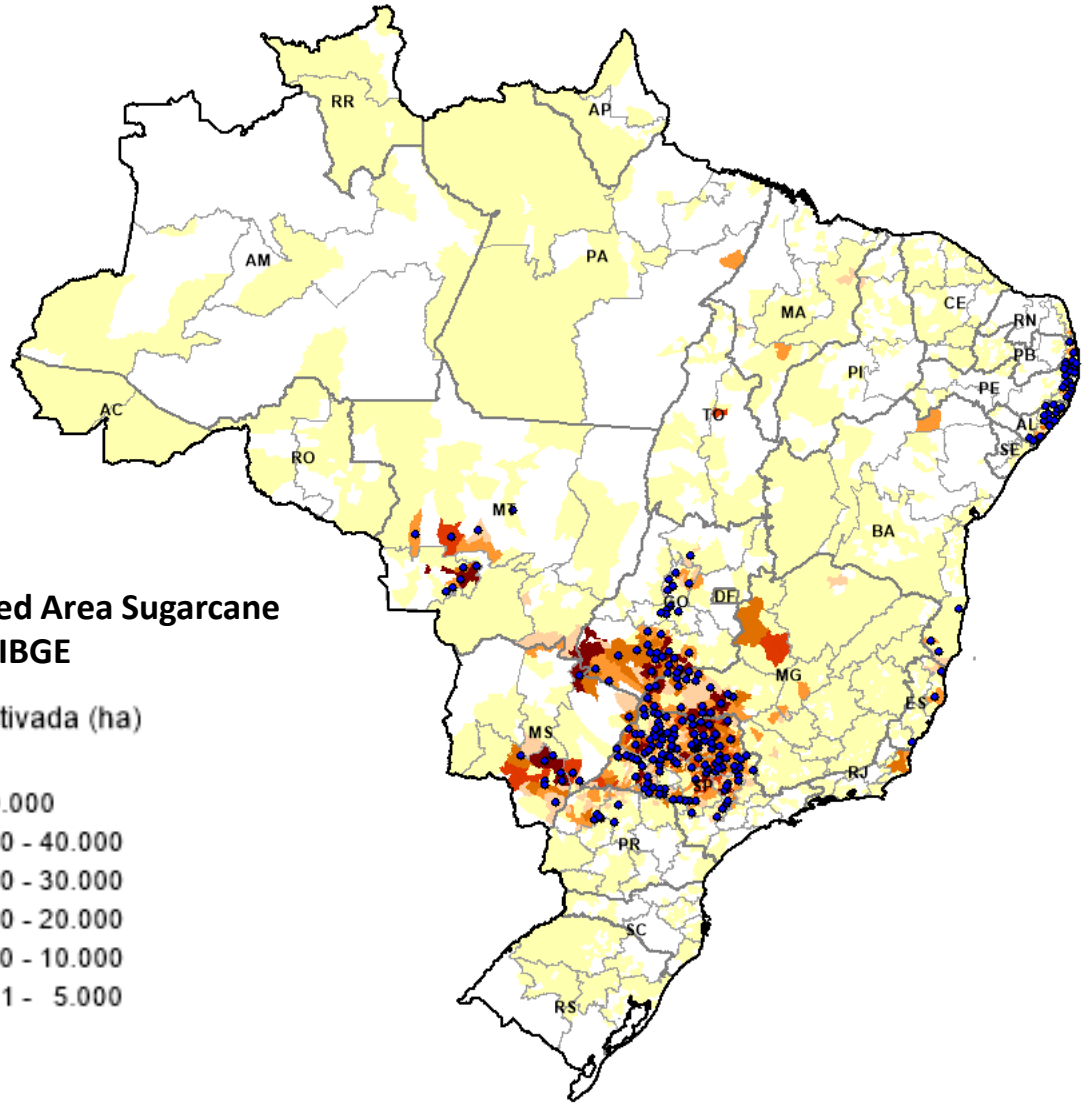
LATAM Product Development Insecticides/Nematicides Manager

Agenda for today...

- Sugar cane in Brazil
- Nematodes in sugarcane in Brazil
- Biological nematicides on sugarcane in Brazil
- Quartzo® - Nematicide on sugarcane in Brazil

INVESTIGATED REGIONS – SUGARCANE

The points plotted on the map indicate the states where interviews were conducted.

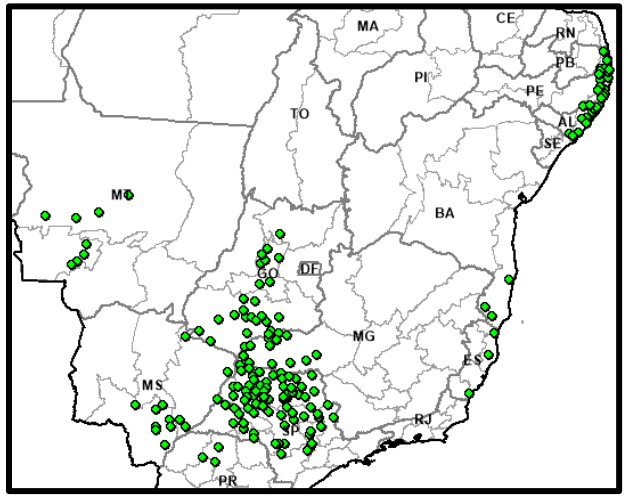


Cultivated Area Sugarcane
Source: IBGE

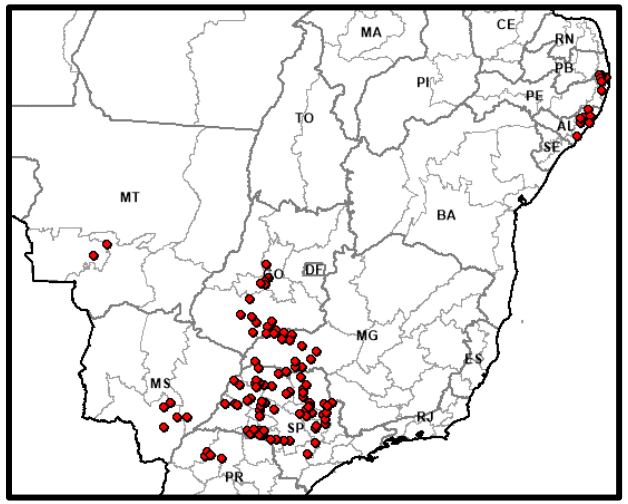
Área Cultivada (ha)
Cana

- >= 40.000
- 30.000 - 40.000
- 20.000 - 30.000
- 10.000 - 20.000
- 5.000 - 10.000
- 1 - 5.000

SUGARMILLS



SUPPLIERS



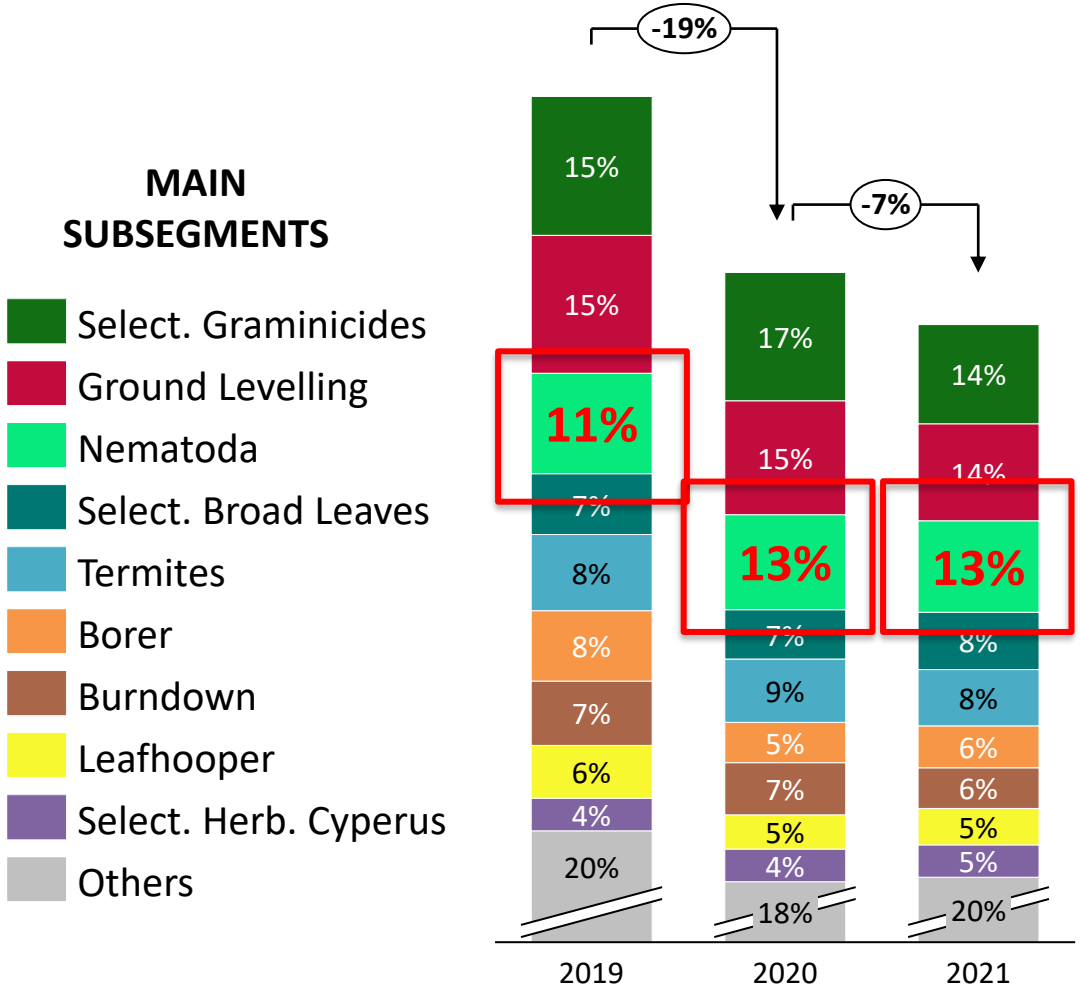
Source: Spark – bip Sugarcane 2021

MAIN SUBSEGMENTS – PLANT vs. RATOON

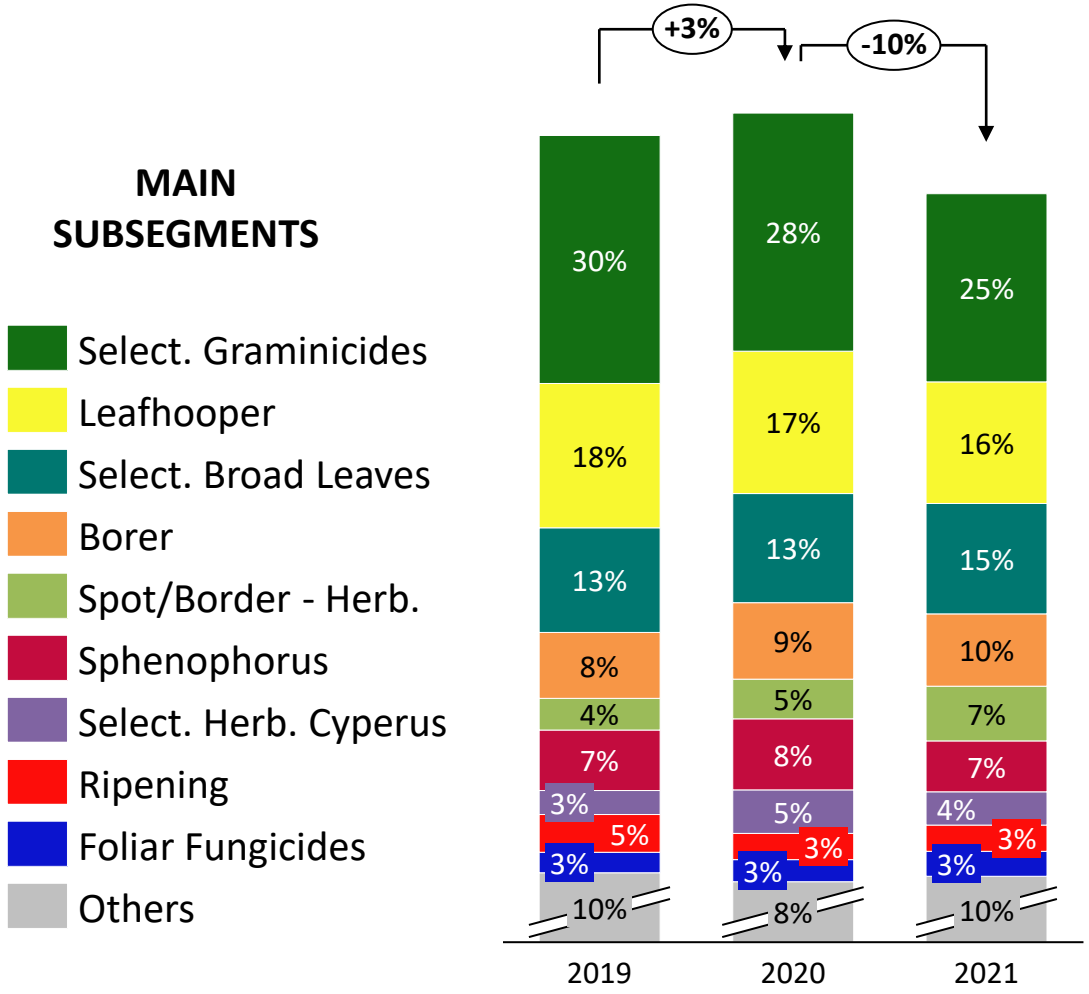
TOTAL MARKET – SUGARCANE

Spark
smarter decisions

PLANT



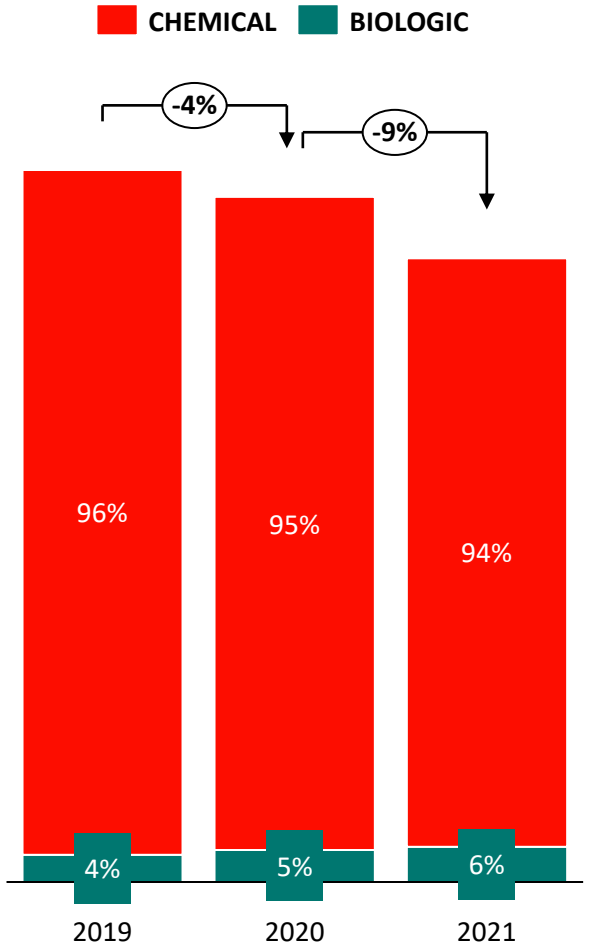
RATOON



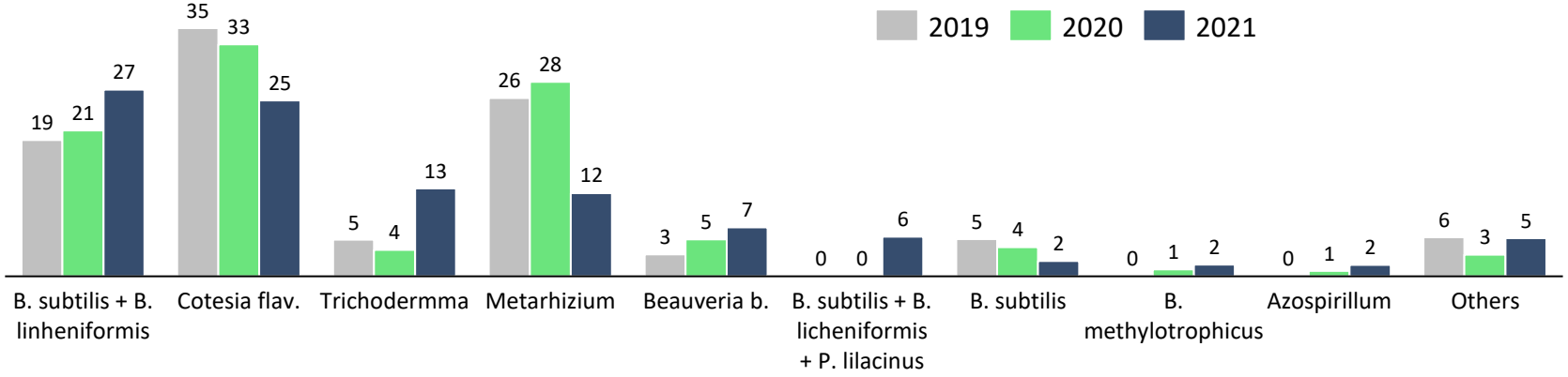
Source: Spark - bip Sugarcane 2021

MARKET IMPORTANCE – BIOLOGICAL PRODUCTS / MAIN AI´S

TOTAL MARKET – SUGARCANE



MARKET SHARE – BIOLOGICAL ACTIVE INGREDIENTS (%)



Source: Spark - bip Sugarcane 2021

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Main nematodes species in sugarcane

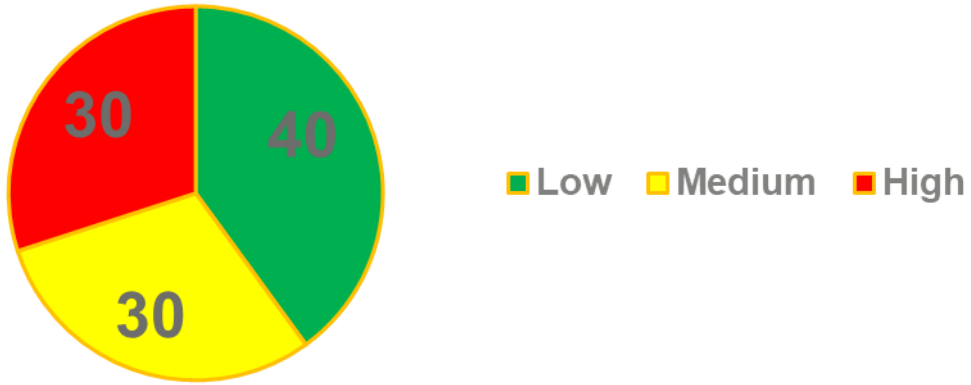
- *Pratylenchus zeae* – 97% of the samples
- *Meloidogyne javanica* – 35% of the samples
- *M. incognita* – 20% of the samples
- *P. brachyurus* – 35% of the samples

Most damaging nematode species in sugarcane fields

- *Meloidogyne incognita* > *M. javanica* > *Pratylenchus zeae* > *P. brachyurus*

Infestation by nematodes species in sugarcane fields

% infestation by nematodes



DMLab
Análises agrícolas e agricultura de precisão

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Soil type and soil moisture are very important for nematode management in sugarcane

Sandy soil

Clay soil

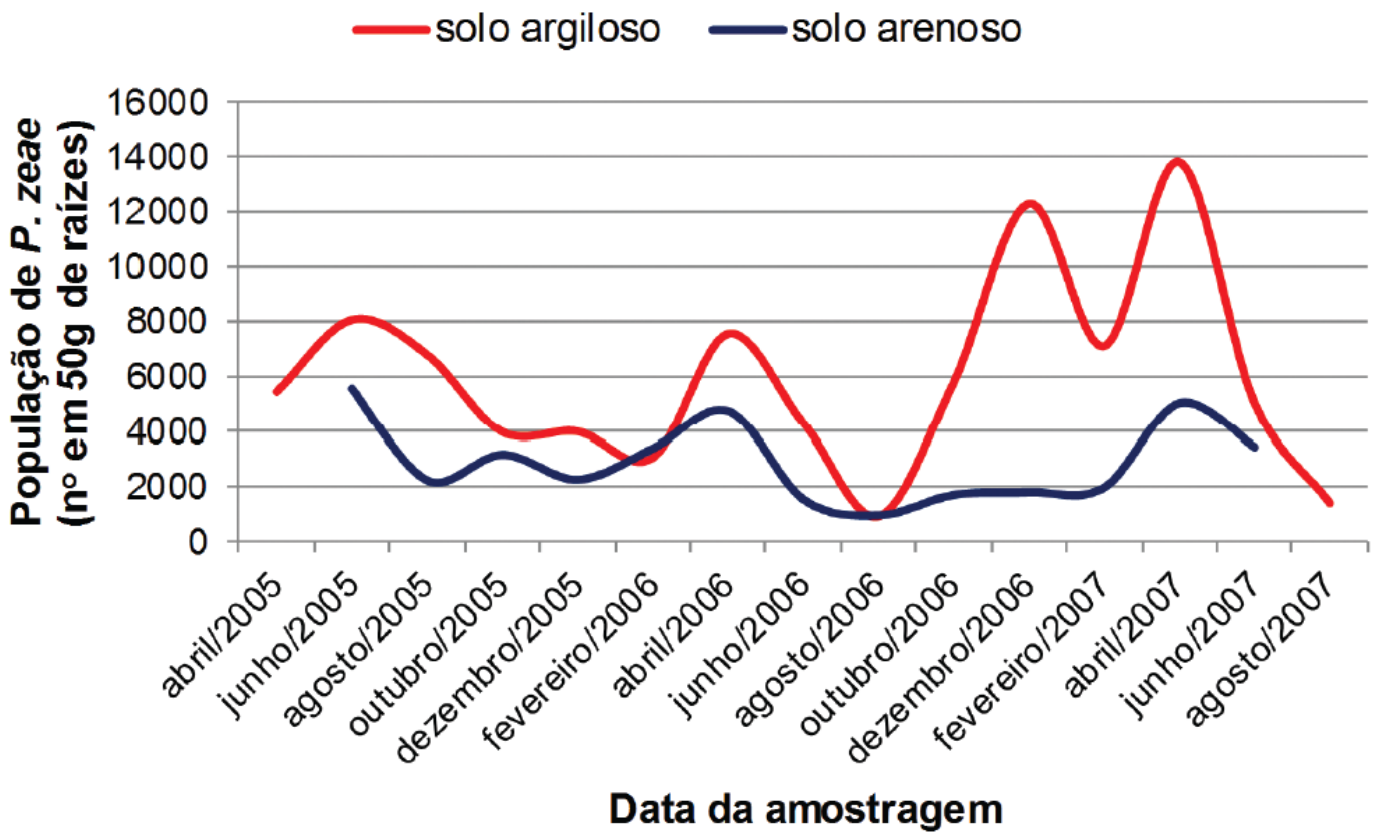

Figura 7. Flutuação populacional de *Pratylenchus zeae* em raízes (50 g) de cana-de-açúcar implantada em dois tipos de solo. (Fonte: DINARDO-MIRANDA e FRACASSO, 2010b).

DMLab
Análises agrícolas e agricultura de precisão

BIOLOGICALS by FMC

Damage by nematodes
Nardini sugar mil – variety CTC 4 , planting date: 08 March 2019

Damage by nematodes
Santo Angelo sugar mil – planting date: 13 March 2019

- Decrease yield in the first harvest 10 a 30%
- Decrease yield at ratoon cane 10 a 20%
- Decrease number of ratoon harvest 1 ratoon

Damage by nematodes – less tillers, shorter plants, crop establishment, lower weight/hectare and lower amount of sugar/ton

DMLab
Análises agrícolas e agricultura de precisão

FMC Bionematicides – Main Crops

Alliance with CHR HANSEN

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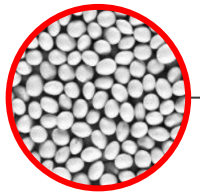
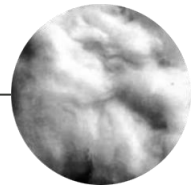
PRESENCE



Soy

Corn

Beans



Cotton

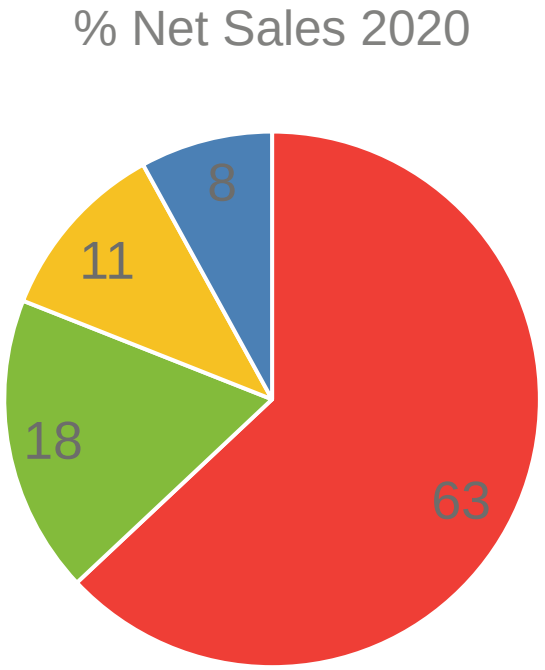
QUARTZO

Sugar cane

Coffee

Pre-germinated rice

Potatoes



Main markets. Sugarcane, Soybean and Coffee

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QUARTZO® formulation and major benefits

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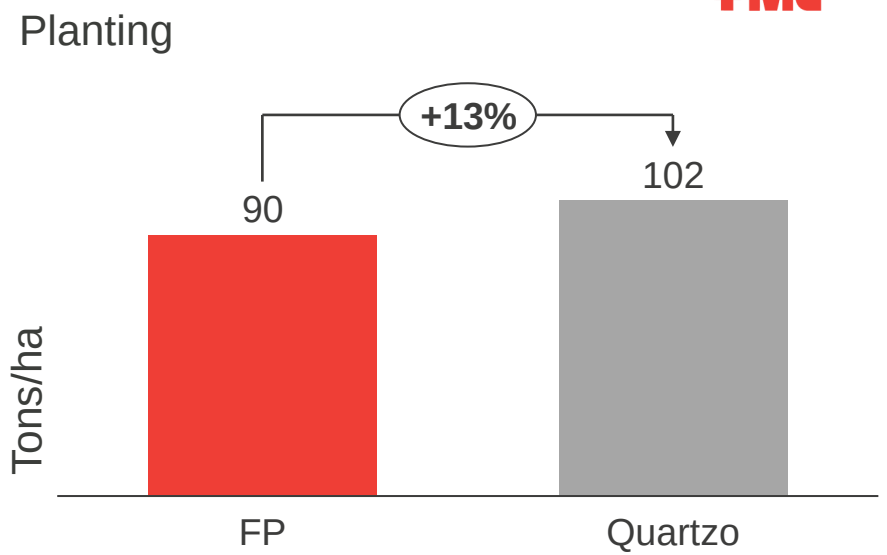
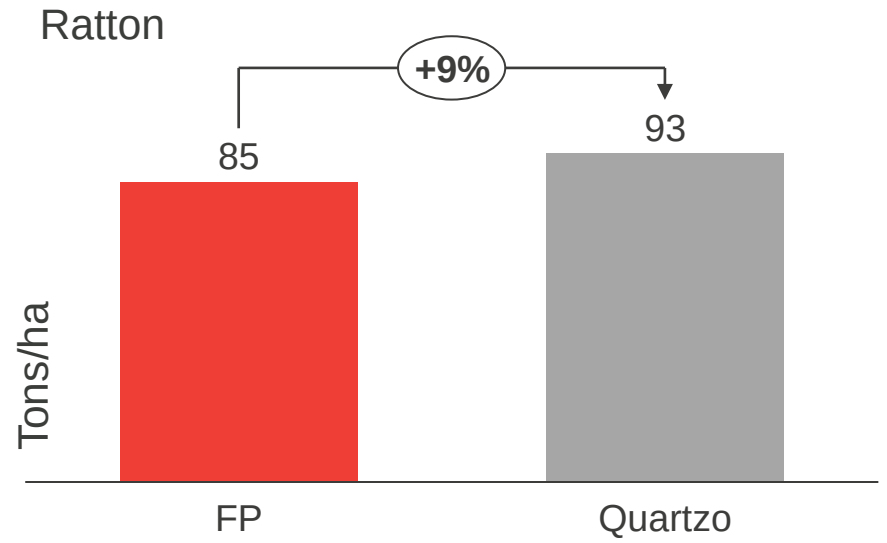
Technical overview

Classification	Bionematicide
Active ingredient	*Bacillus subtilis* (FMCH002) *Bacillus licheniformis* (FMCH001)
Shelf life	36 months
Storage conditions	N/A
Compatibility	Full compatibility with fertilizers and pesticides
Formulation	Wettability Powder (WP)
Application	In-furrow/ratoon
Dosage	200g/ha
Minimum guarantee of microorganisms	>2 x 10^{11} CFU/g
Non-GMO	Yes





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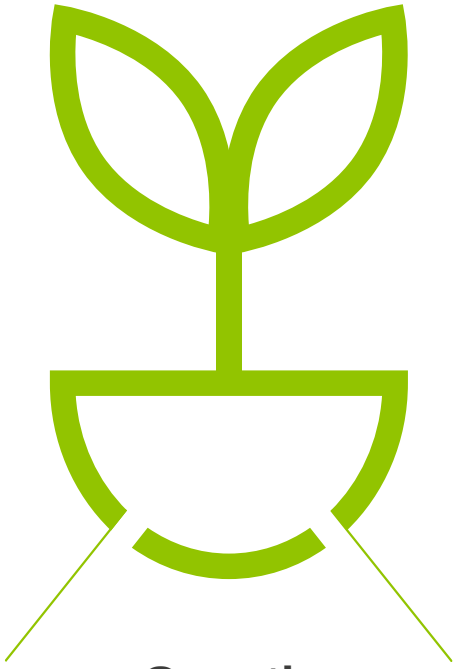
Multiple MoA



Root colonization

Bacteria colonize the root system forming chemical and physical protection

Bionematicide

Bacteria secrete metabolites that have direct action on the viability of nematode eggs and J2

Growth promoter

Bacteria move through the root hunting exudates, competing with pathogens in the search for nutrients and in the occupation of niches in the root

Water deficit – Sugarcane with Quartzo®

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Treatments	Description
WW/No Quartzo®	Plants without water stress and without Quartzo®
WD/No Quartzo®	Plants with water stress and without Quartzo®
WW/with Quartzo®	Plants without water stress and with Quartzo®
WD/with Quartzo®	Plants with water stress and with Quartzo®

Comparison of plant development at 7 days after beginning of water stress.

Comparison of plant development at 14 days after beginning of water stress.

Improved soil enzymatic activity with Quartzo®

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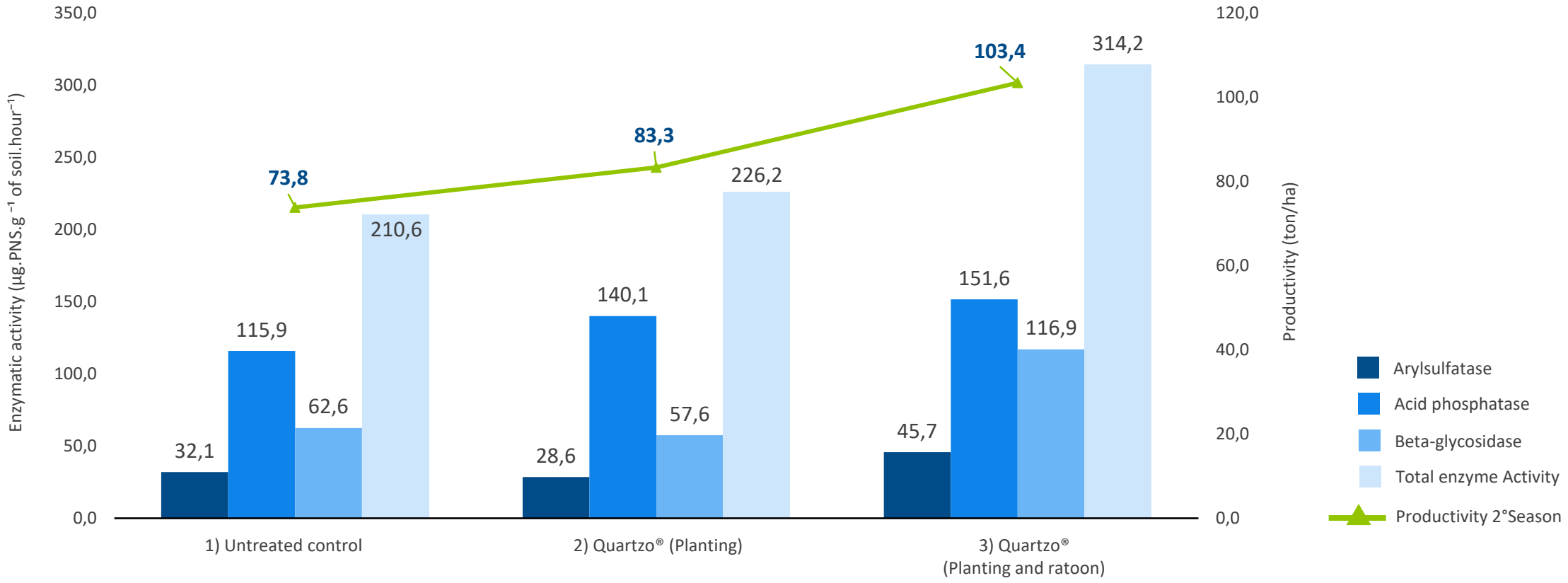
Successive Quartzo® application in sugarcane cycle – wet period



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Why is Quartzo® successful in Brazil on sugarcane market?

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- Efficacy – healthier plants by protecting the roots
- Similar to Chemical products in terms of yield in comparison with treated plots
- Compatibility with other products used on planting (FMC Gennesis program – insecticide, fungicide and Quartzo®)

Beyond...

- **Can be used at different planting timing (wet and dry season) – water deficit**
- **Increase enzymatic activity on soil – delivering better nutrients to the plants**

Delivering more technical background supports better positioning of bionematicide products in sugarcane market

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