

Understanding and managing abnormal shoot growth (ASG) in table grapes

A multi-regional analysis in Chile

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2023



10TH
INTERNATIONAL
TABLE GRAPE
SYMPOSIUM

26 NOV
TO
1 DEC 2023

SOMERSET WEST
SOUTH AFRICA



The Problem

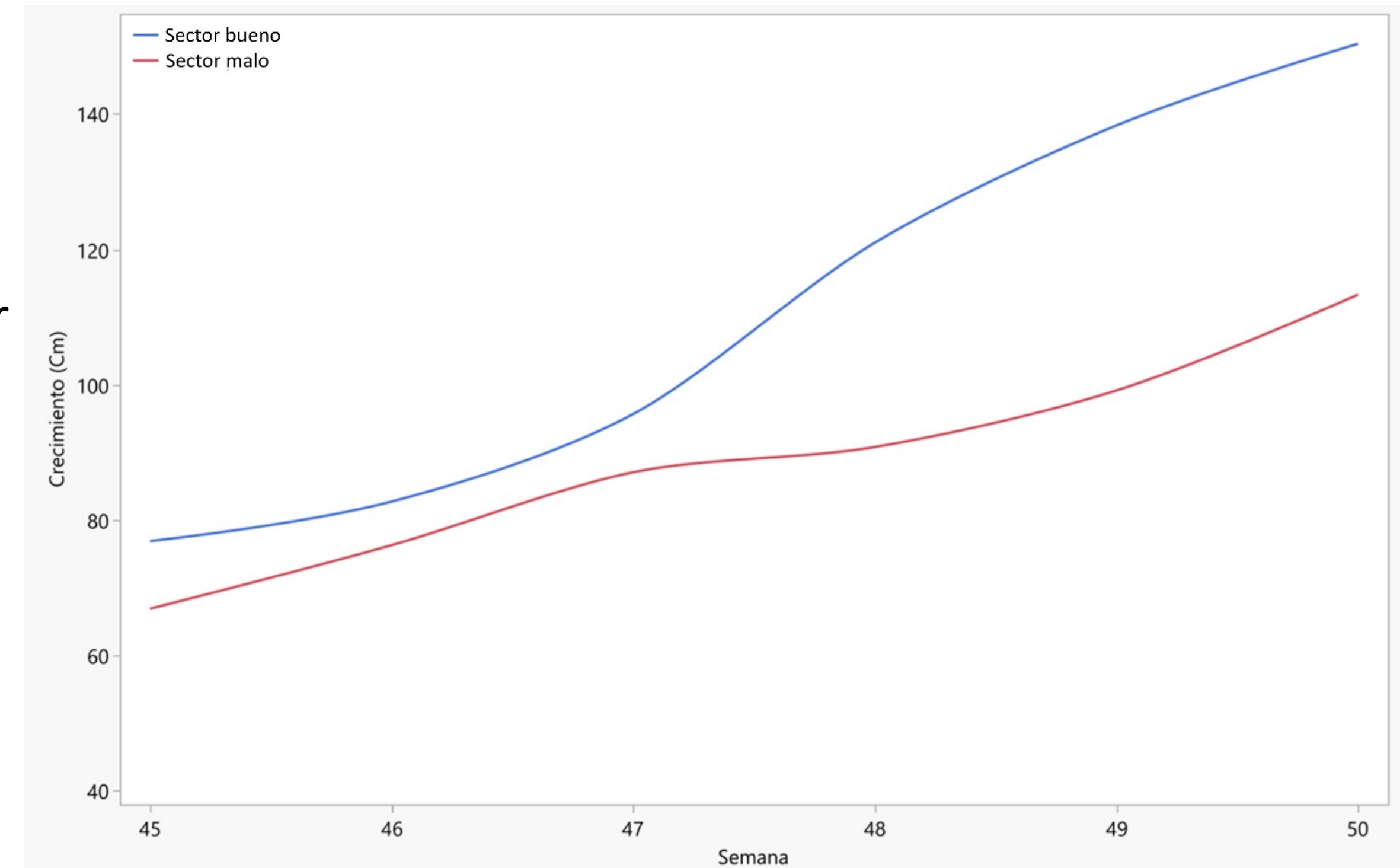
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The Problem

Abnormal Shoot growth (ASG)

- The Shoot growth stop at around 20- 30 cm.
- Growth resumes post fruit set, often from lateral o secondary shoots.
- The clusters present an anormal fruit set. From over shutter to no shutter.
- The result is a poor-quality fruit
 - Uneven berry size
 - Uneven maturity
 - Shutter
 - More incidence of bunch stem necrosis and water berries
- Reduced production.



Graph 1. Growth of shoots by sector, season 2022-23

Symptoms

- Stunt shoot
 - Zigzag
- Abnormal Fruit Set
 - Over Shatter
 - No Shater
 - Uneven Berry Size



Symptoms

- Ammonium Toxicity
- Bunch Stem Necrosis
- Water Berry
- Uneven Berry Maturation



Hypotheses and Ideas

- Frost (autumn, winter, spring)
- Spring Low Temperatures
- Cavitation
- Wood disease (virus, fungi)
- Mites
- Soil Salinity
- Nutritional imbalance
- Lack of reserves
- Root detachment from aerial part.



Hypotheses and Ideas

- Is almost exclusive for grafted varieties
- Is less common in rainy regions
- Is more common in young vines (3-4 years)
- In the same plot there is normal and abnormal plants
- In areas with sandy soils Is less common
- Plastic roof minimize the symptoms



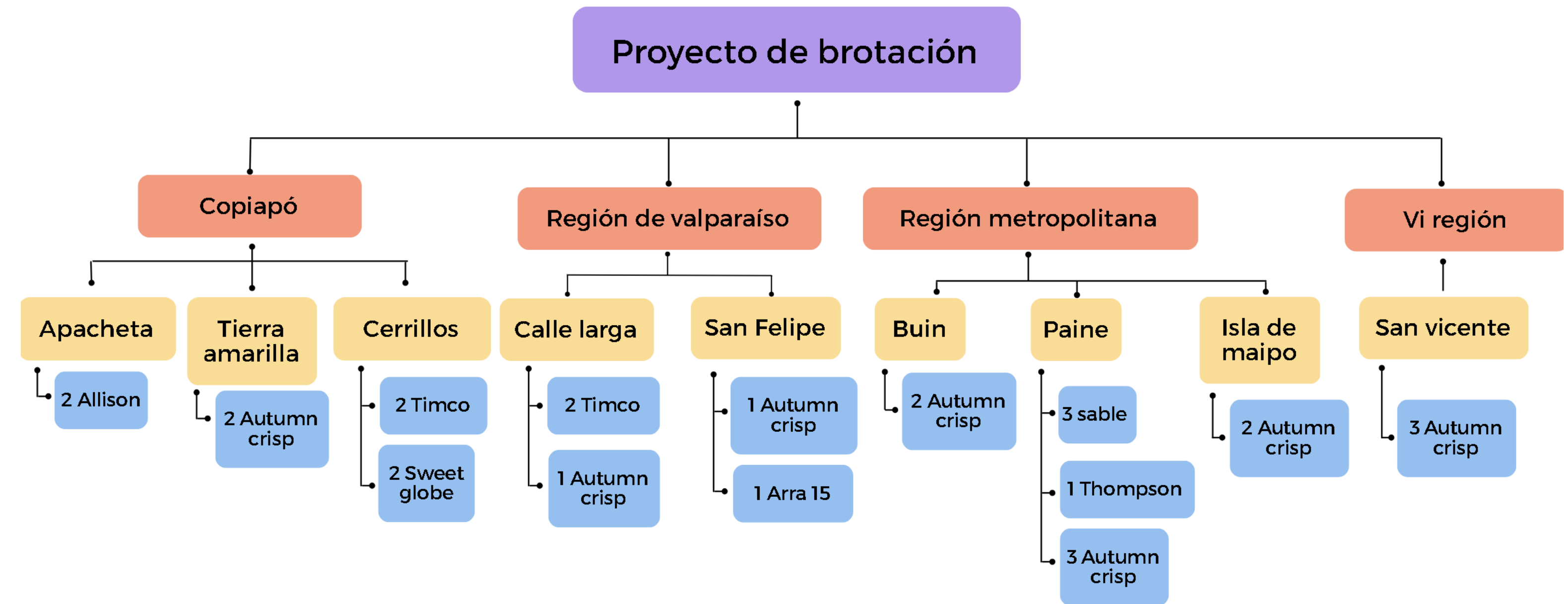
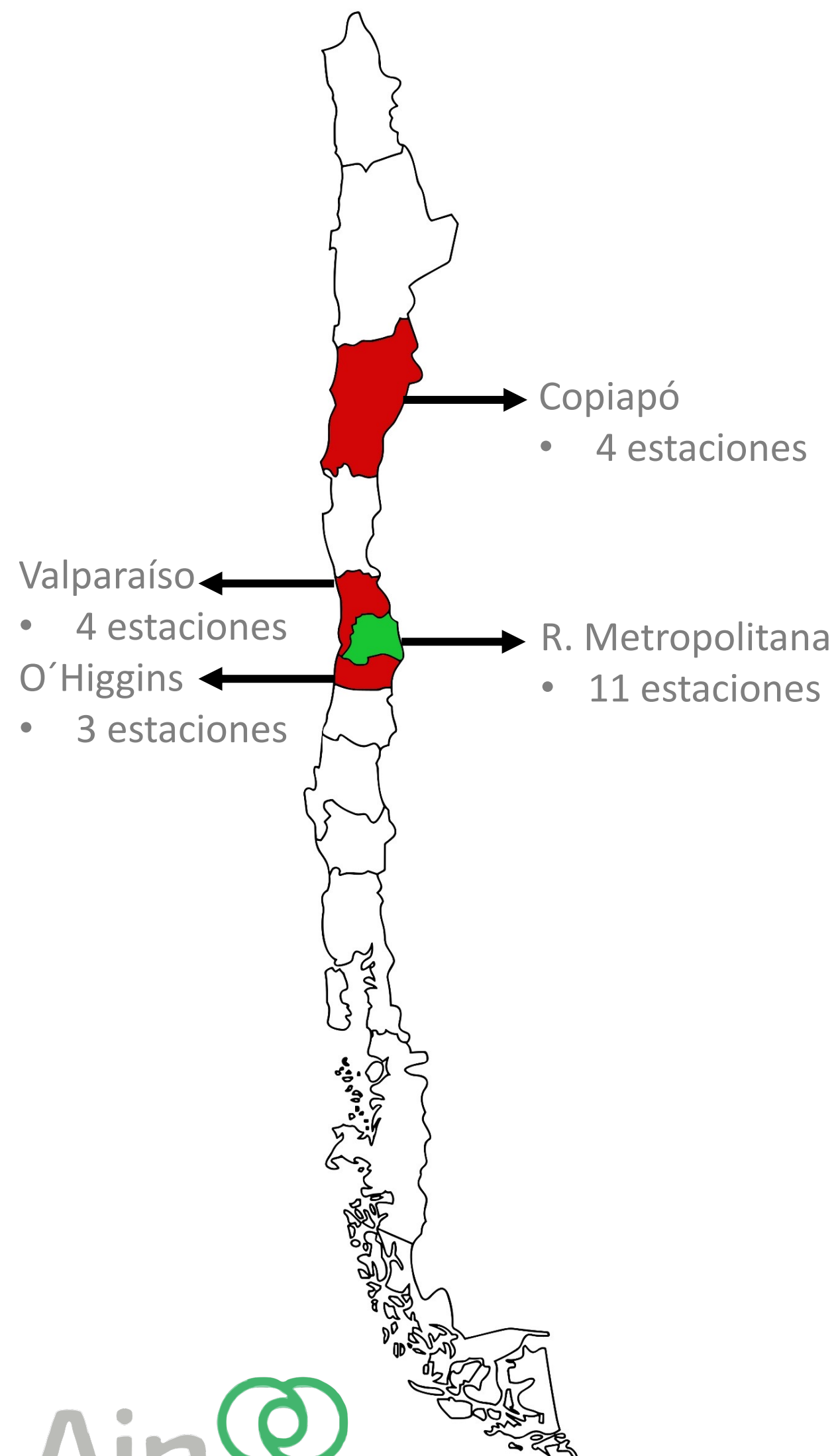
The Project



Methodology:

Monitoring station

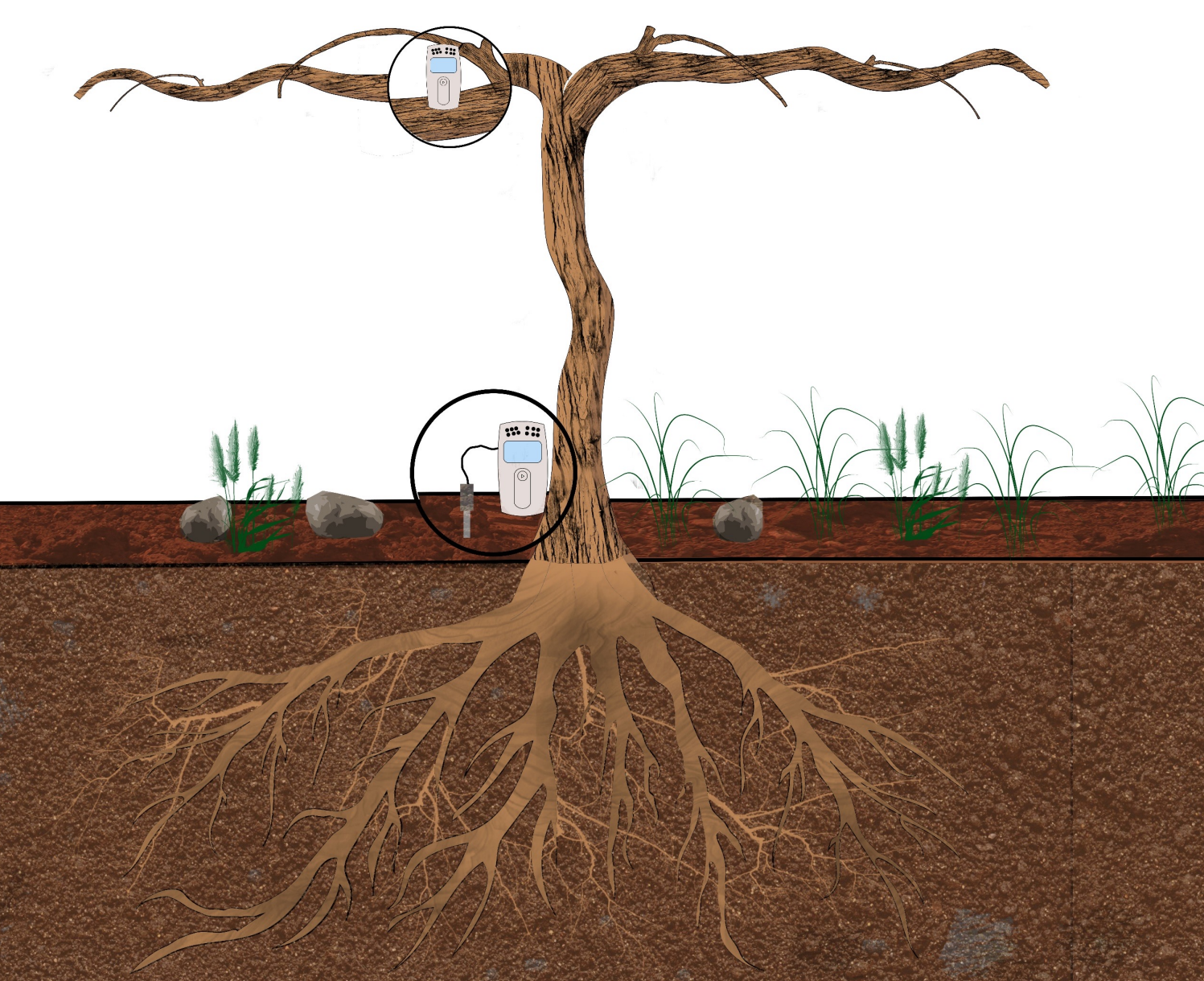
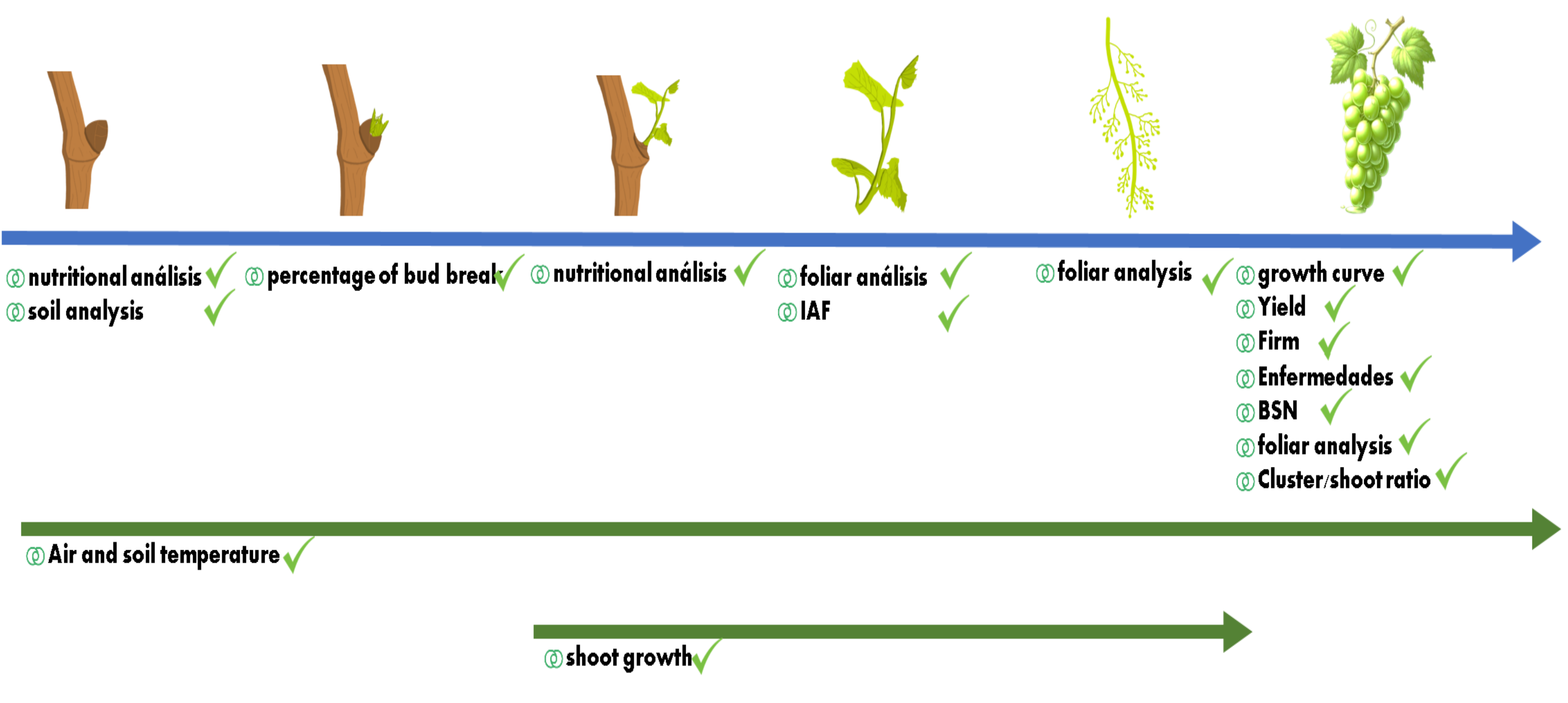
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- The principal productions areas; Copiapo, Aconcagua, Metro, Ohiggins
- 23 monitoring Stations, 50 substation
- 7 Varieties
- 3 rootstocks

Methodology:

Sampling Techniques and Analysis Methods



Shoot growth were mesure weekly until two weeks after bloom

The results

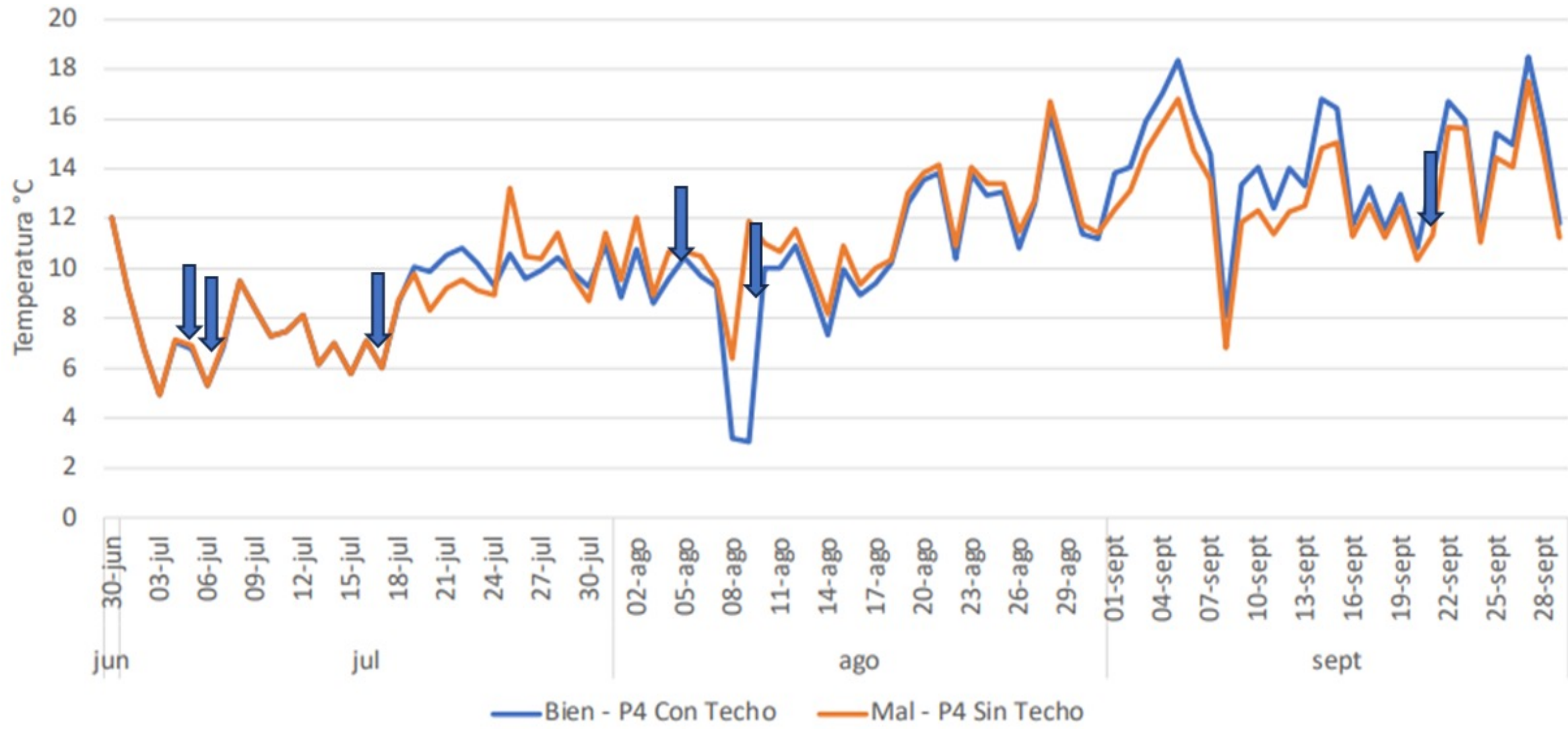


Key finding

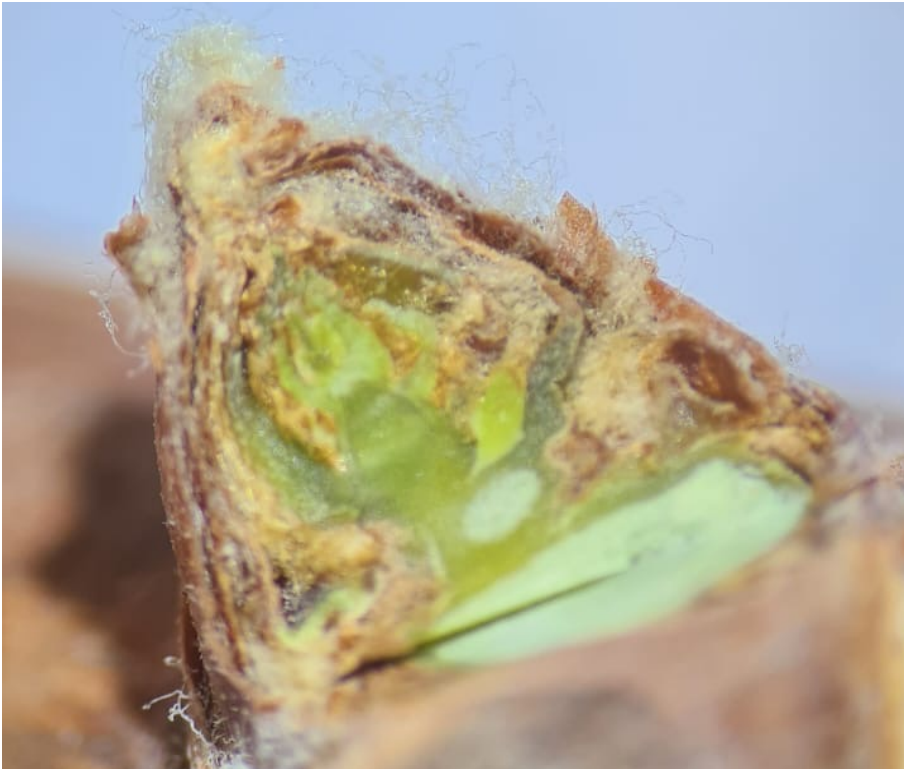
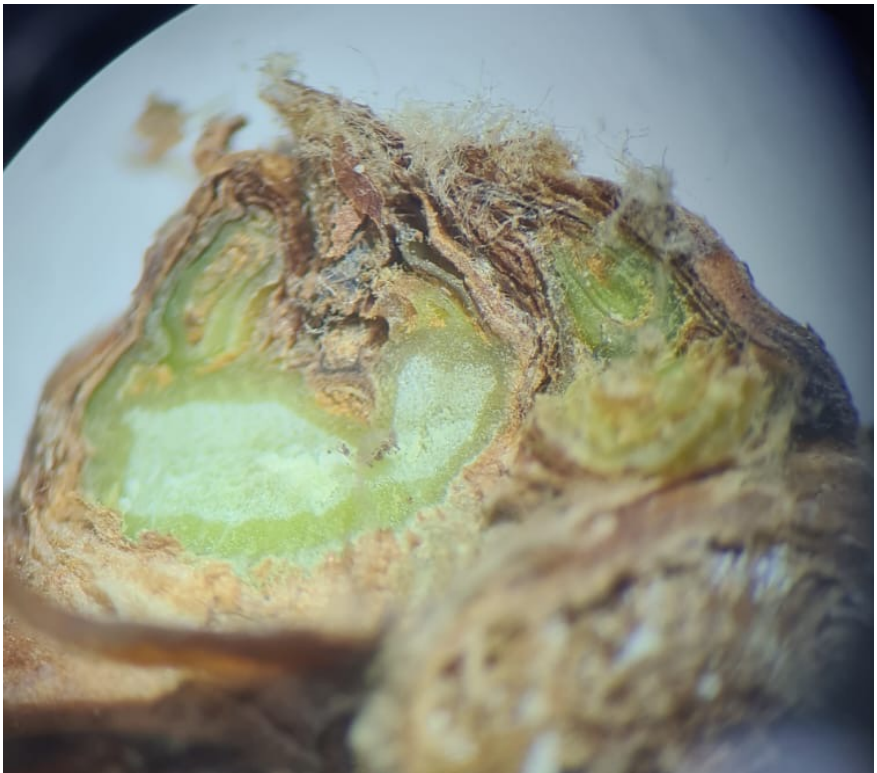
Necrotic buds

Percentage of necrotic buds according to shoot growth classification, 2022-23 season.

Shoot Detention	Dead buds (%)
No	8,2%
Yes	11,2%



Graph 2. temperature recording using a thermocouple in Thompson Seedless, 2022-23 season.

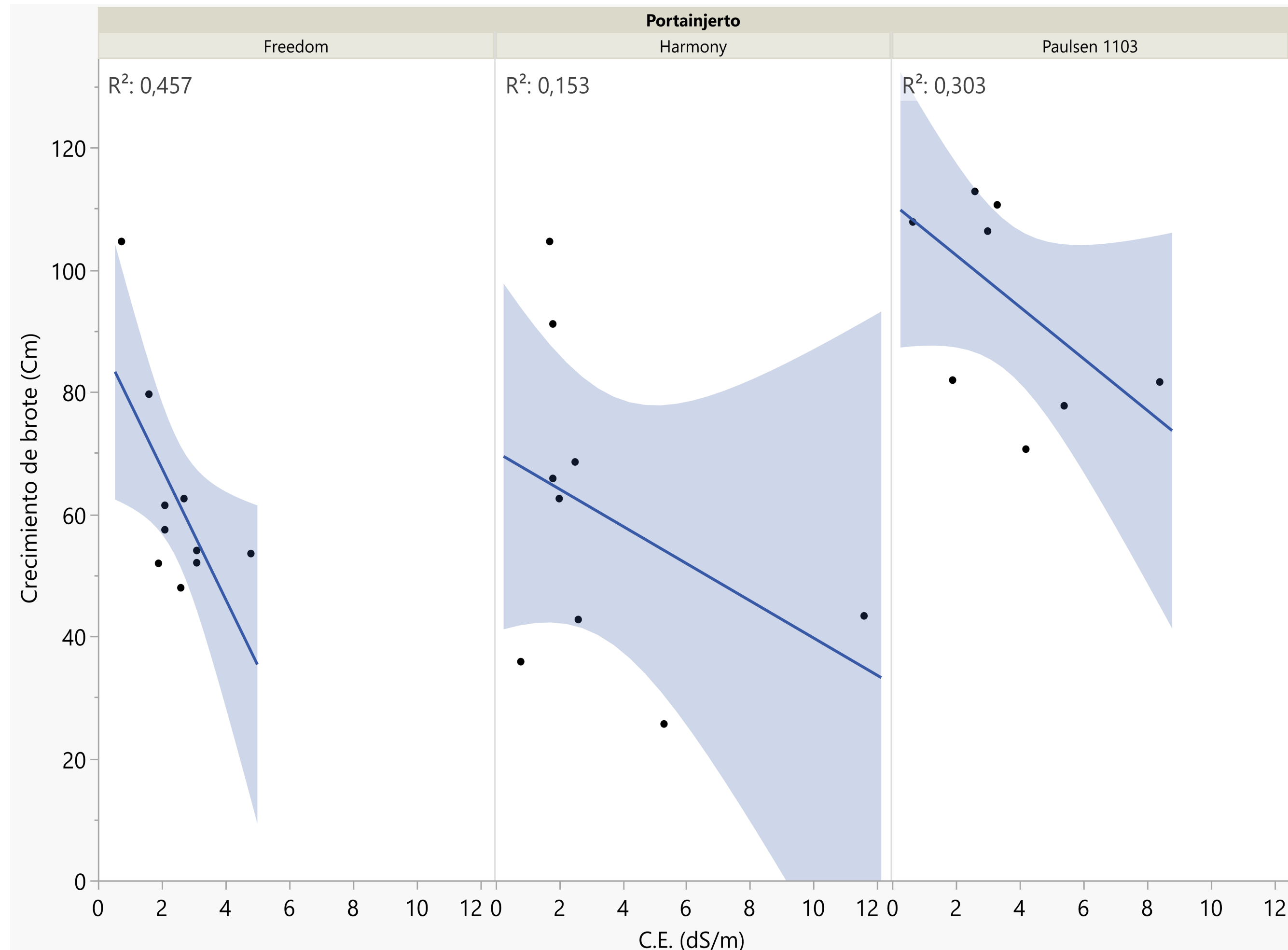


- There is not significant relation between necrotic/dead buds and the occurrence of the symptom.
- Without necrotic buds ""he frozen theory" fall.

Key finding

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Electrical Conductivity and Shoot Development in tree Rootstocks



Graph 3. Shoot growth dispersion analysis according to recorded soil electrical conductivity, season 2022-23.

- The results would indicate a different sensitivity of the rootstocks to soil salinity
- The Freedom rootstock would be the most sensitive, and Paulsen the most resistant.
- The great variability is explained by the diversity of soils, areas, and varieties.

There is NO good correlation between the recorded data, but there is a tendency for compare between rootstock

Root Starch Level

Roots

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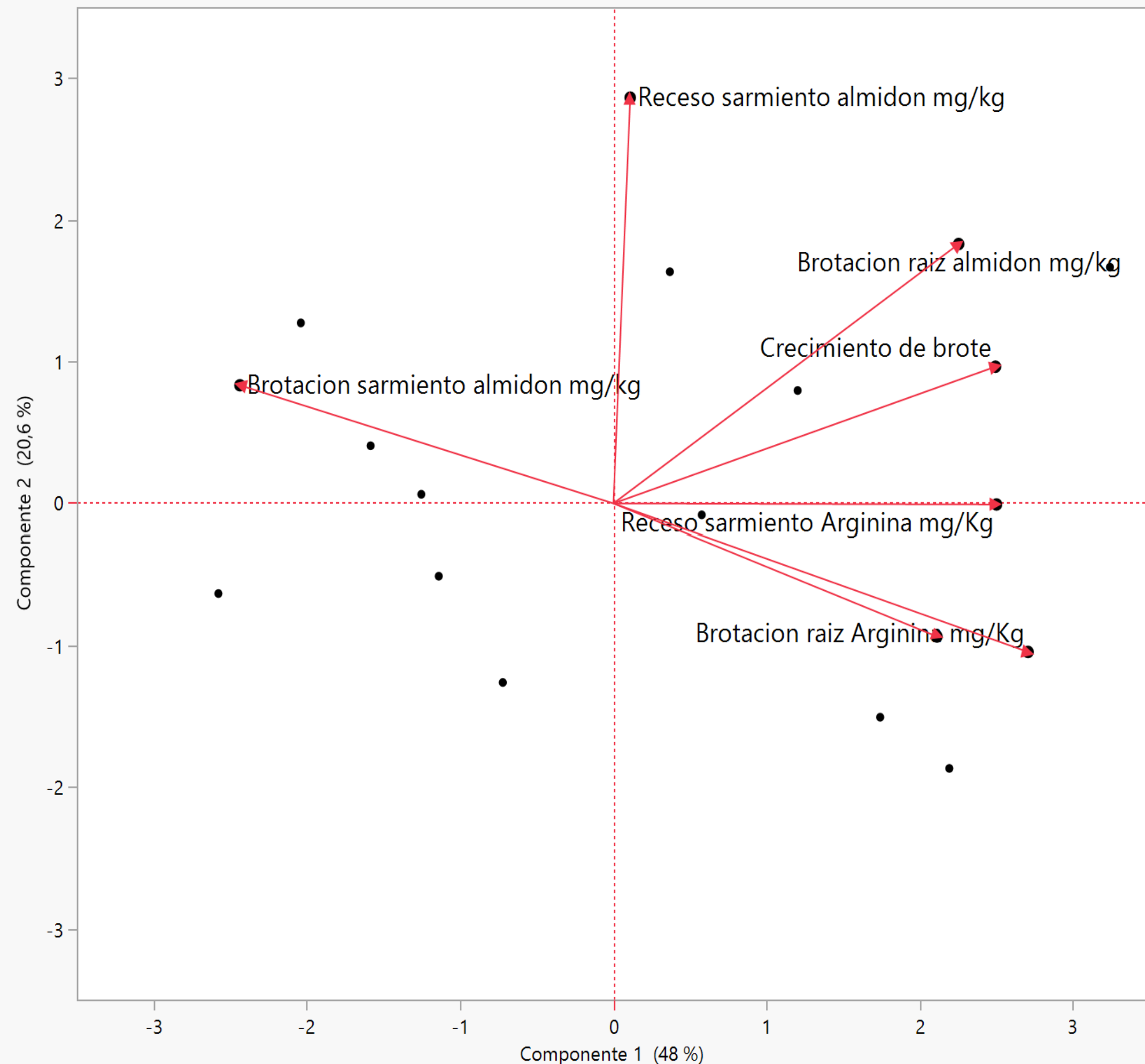
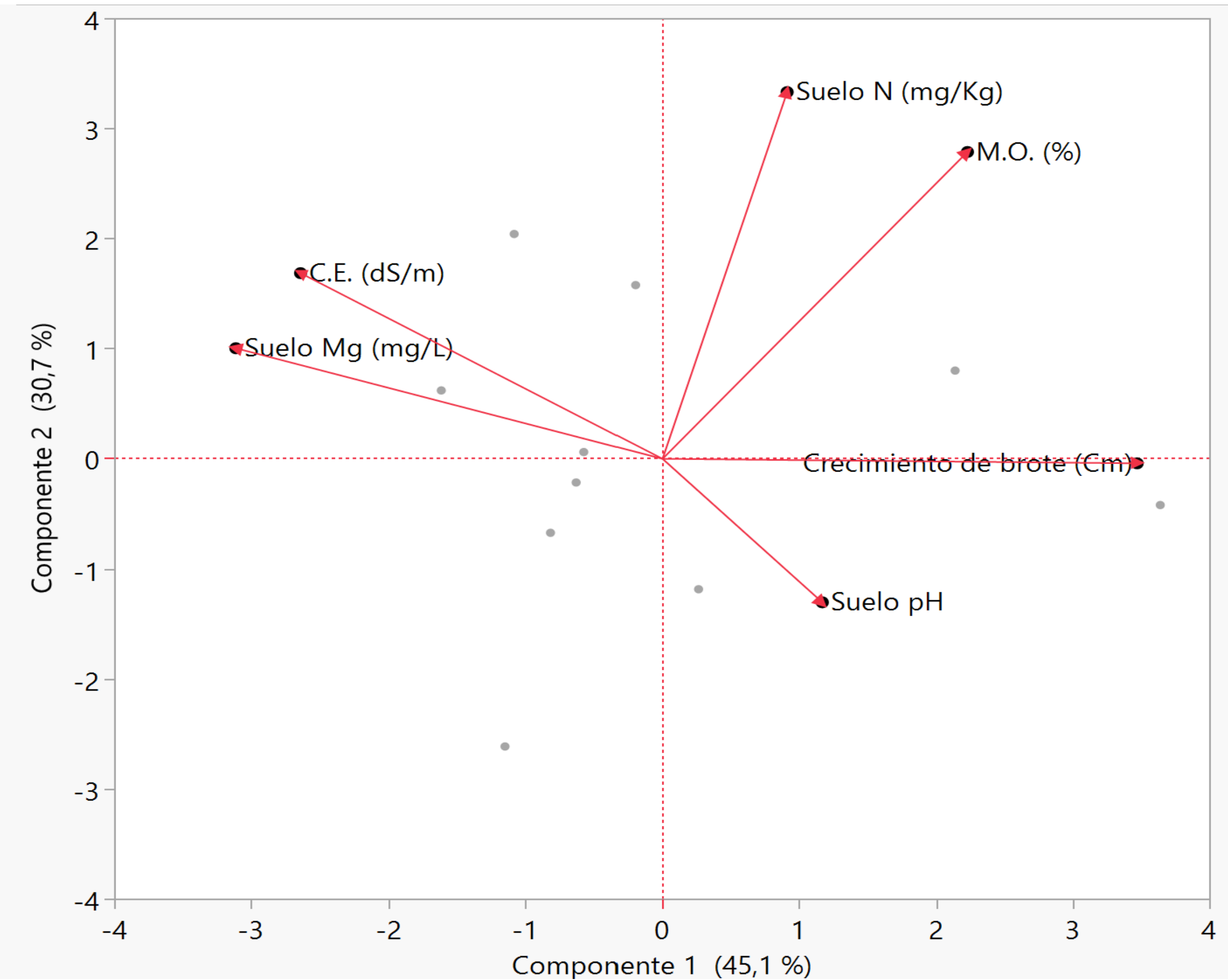


Figure 3. Biplot of the Principal Component Analysis obtained with the standardized data from the sector with growth problems, season 2022-23.

- There would be a positive correlation between shoot growth and the level of starch in the roots at the time of bud break

Electrical Conductivity and Shoot Development 15



Multivariate analysis correlation matrix for shoot growth according to soil analysis.

Parameters	
Shoot lenght (cm)	1,000
Soil electrical conductivity (dS/m)	-0,6762
Soil N (mg/kg)	0,2144
Soil Mg(mg/kg)	-0,7071
pH	0,3911
Organic Matter	0,5783

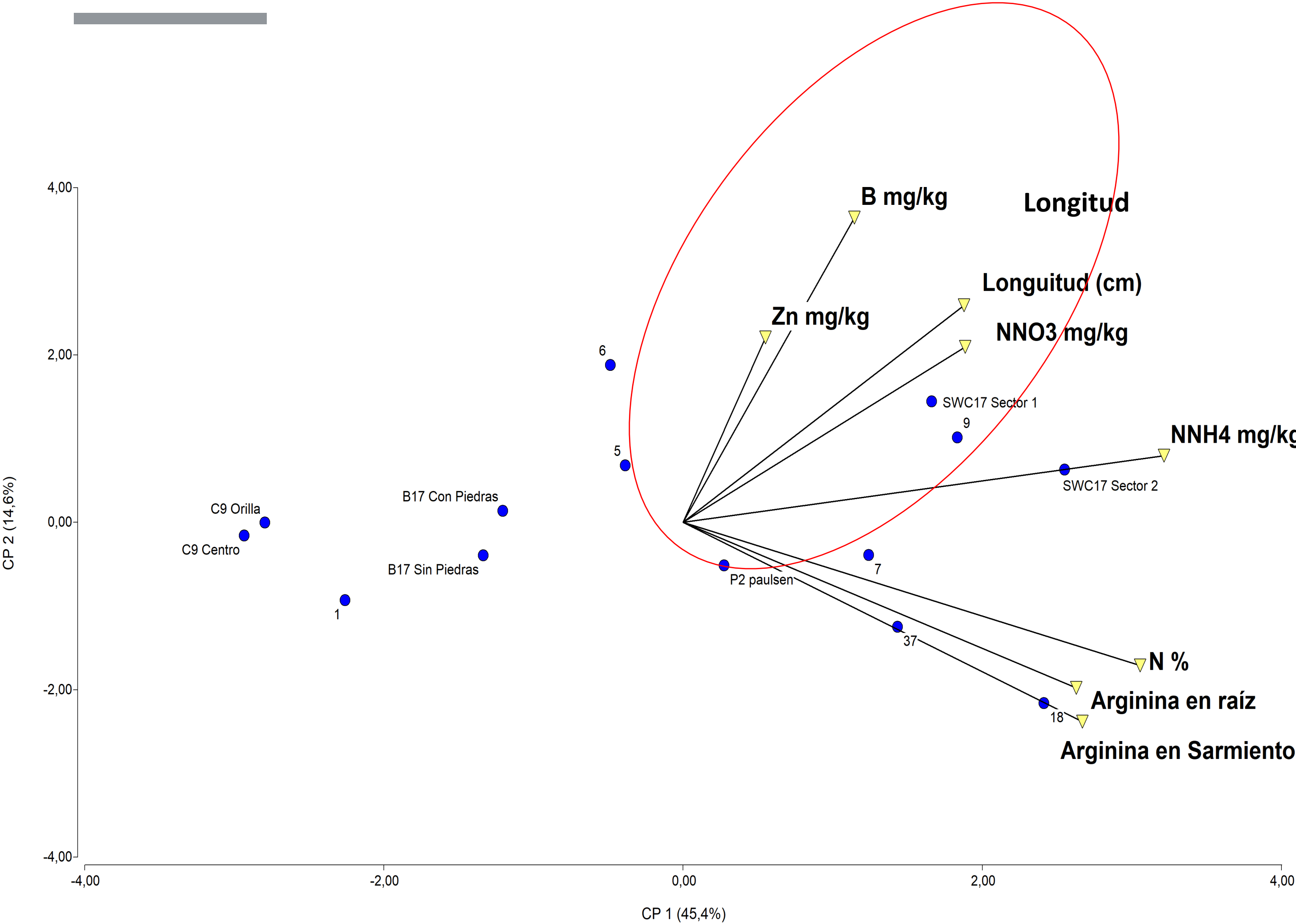
The correlation values range between $-1 < 0 < 1$
With values less than 0 being negative correlations and higher being positive correlations.

- In this case, there is an inverse relationship:
higher soil electrical conductivity leads to reduced shoot growth
- higher levels of soil organic matter are associated with increased shoot

Graph 4. Biplot of the Principal Component Analysis obtained with the standardized data, season 2022-23.

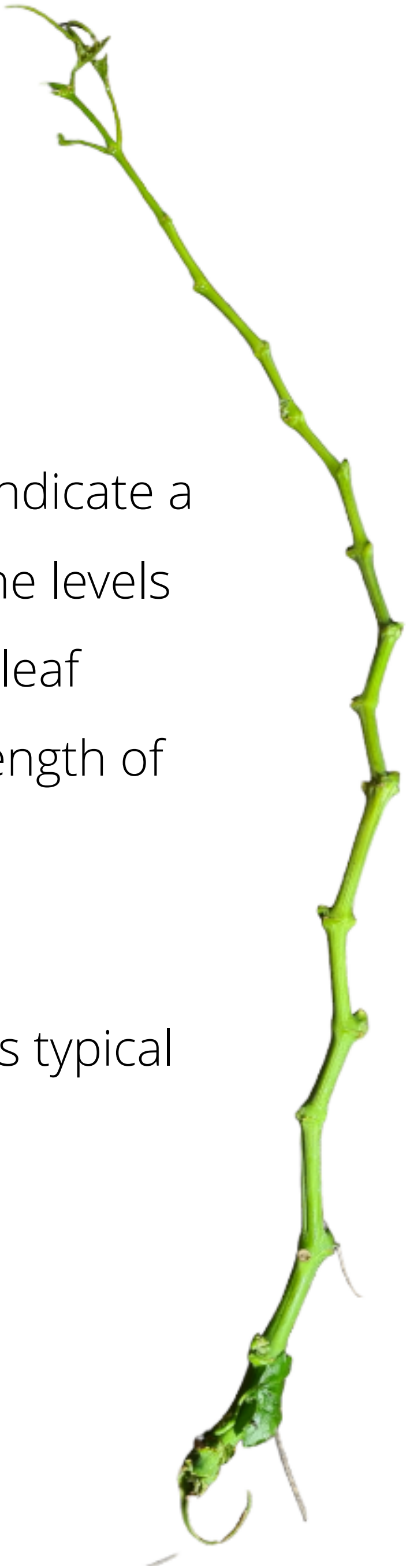
Nutrition levels

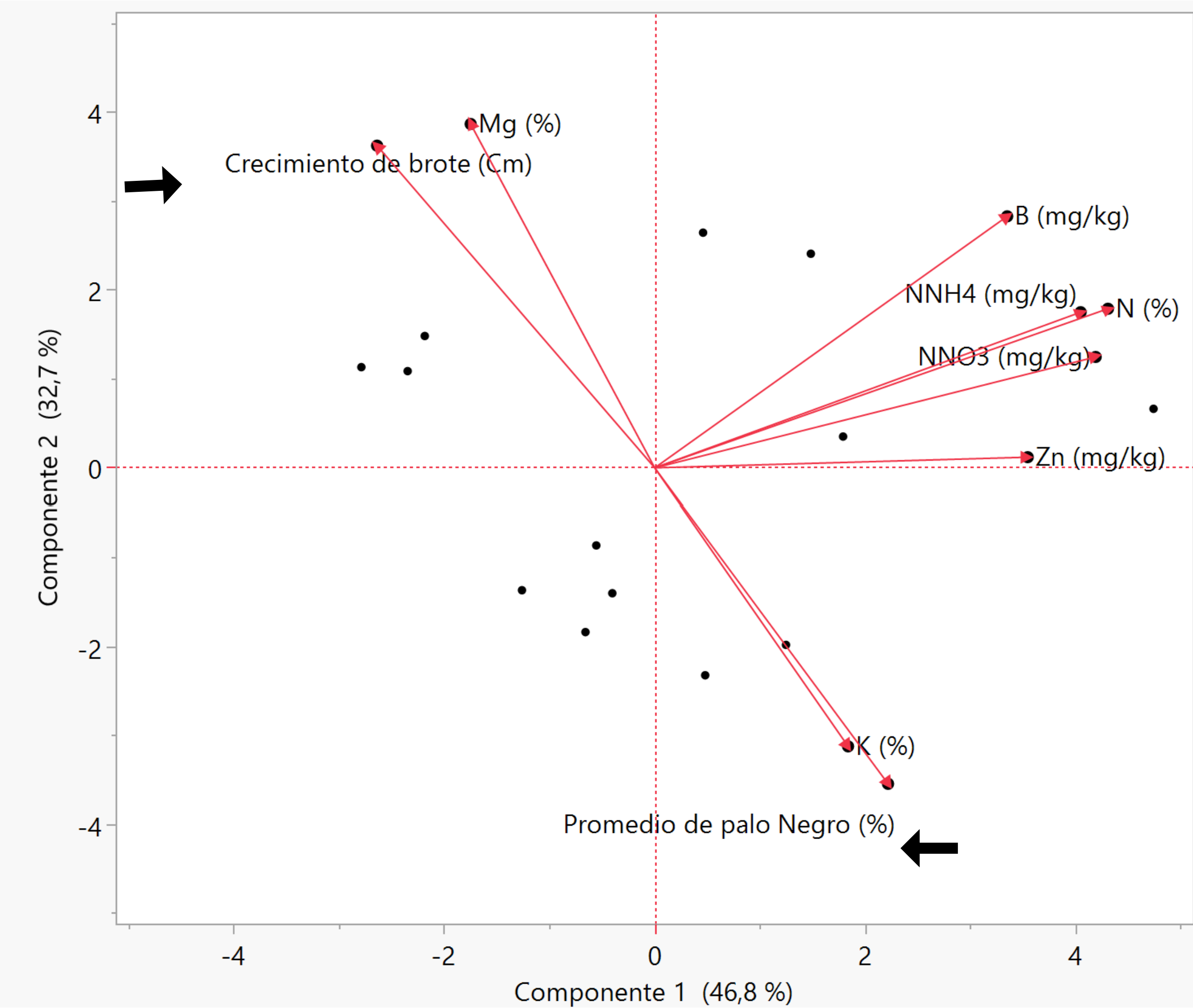
Zinc and Boron Levels



. Graph 5. Biplot of the Principal Component Analysis obtained with the standardized data season 2022-23.

- The results would indicate a relation between the levels of Zinc and Boron (leaf analysis) with the length of the shoots
- The zigzag growth is typical of Zinc deficiency





Graph 8. Biplot of the Principal Component Analysis obtained with the standardized data of foliar analysis in flowering, shoot growth and BSN incidence, season 2022-23.

Multivariate analysis correlation matrix for blackwood incidence by shoot growth

	Shoot Growth(Cm)	Water Berry (%)
Shoot Growth(Cm)	1,000	-0,808
Water Berry(%)	-0,808	1,000
NNH4 (mg/kg)	-0,188	0,183
NNO3 (mg/kg)	-0,246	0,140
N (%) Bloom	-0,186	0,183
Mg (%) Bloom	0,712	-0,795
K (%) Bloom	-0,704	0,407

- The Shoot Growth Disorder is positive correlated with water berry disorder in this study
- The lower the Mg(%) and the higher the foliar K(%) at bloom, the higher the incidence of Water Berries
- Nitrogen levels alone would not explain the incidence of Water Berries

Results and Discussion

Soil – Salinity – Irrigation - Root

- The problem is related with the salinity of the soil
- The rootstock election is critical
- Good drainage and infiltration that allow salt leaching is a critical management
- pH level of the soil tested are high (more than 7,2). This can affect the nutrient availability

Balanced Nutrition

- The presence of zinc, boron and nitrate levels in the flowering analysis would have a direct influence on shoot development, suggesting that a decrease in the availability of these nutrients could have negative consequences on the quality and length of the shoots.
- Early foliar application of Zinc, Magnesium, Calcium (+ Eklonia) were tested this season..

Nobel Hypothesis

"The Abnormal Shoot Growth in grapevines is potentially linked to misaligned rootstock and shoot growth cycles, influenced by soil conditions and nutrient disequilibrium"



Proposal Management

The preventive solution is based on irrigation and nutrition management that, on one hand, promotes the accumulation of reserves post-harvest, maintains active roots throughout the year, and on the other hand, involves irrigation management that encourages oxygenation and salt leaching, along with balanced nutrition



Key Factors



Soil Condition

**Irrigation
Management**



**Vigor / Storage
Equilibrium**

**Balanced
Nutrition**





Gracias Thank You

Ain@



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A close-up photograph of a person's hand, with fingers spread, holding a dense network of light-colored, fibrous roots. The roots are coated in dark, rich soil. The background is dark and out of focus, showing more soil and some roots. The lighting is warm, highlighting the texture of the roots and the skin of the hand.

*You can't have the
fruits without the
roots*

Rodrigo Sapiain