Sensory variables as quality indicators of Crimson Seedless grapes grown with reduced amounts of water under different micro-climatic conditions

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SATI South African Table Grape Industry

Stellenbosch University

Università di Foggia

NRF National Research Foundation

Università degli Studi di Torino

Università degli Studi di Palermo

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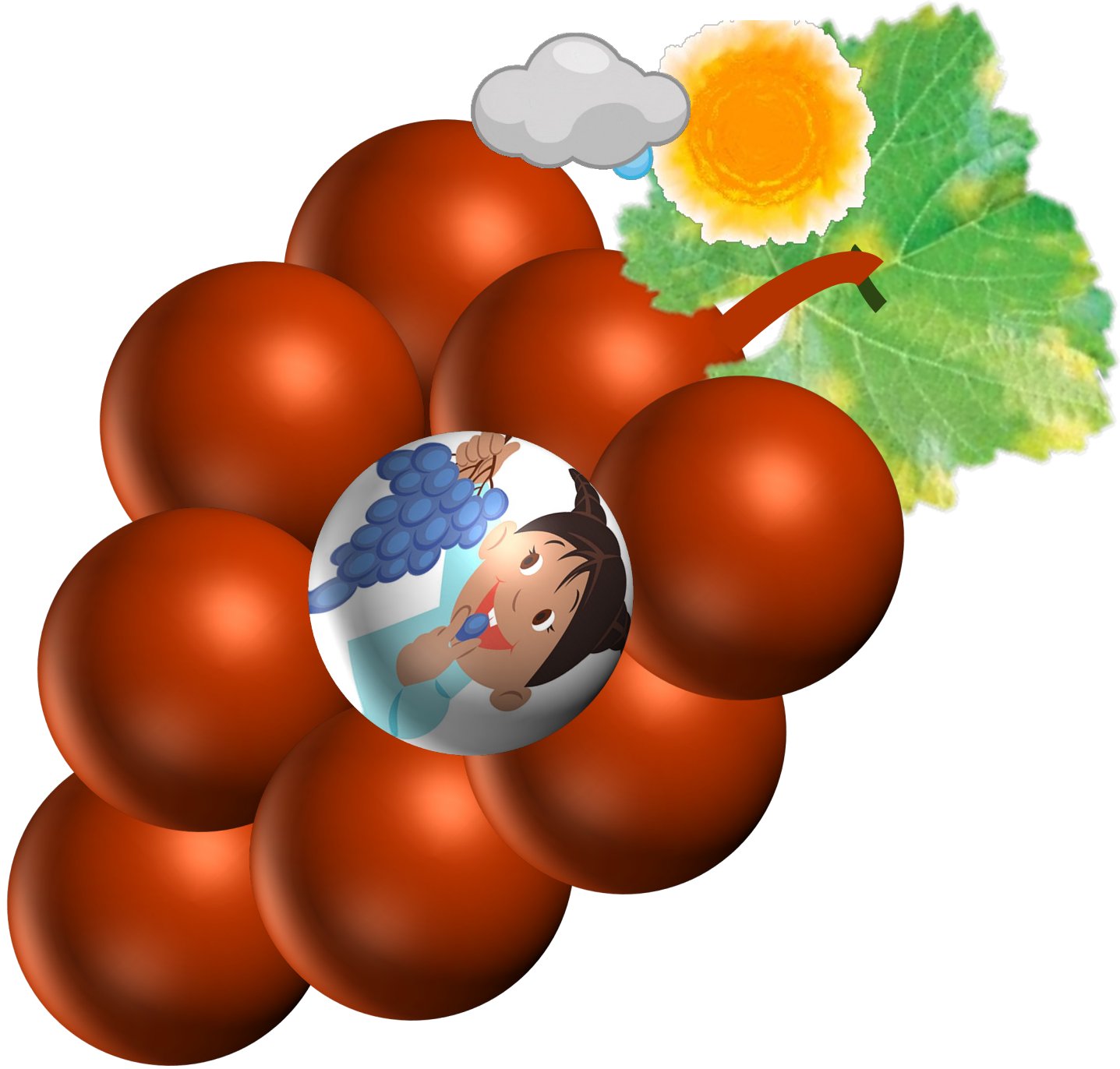
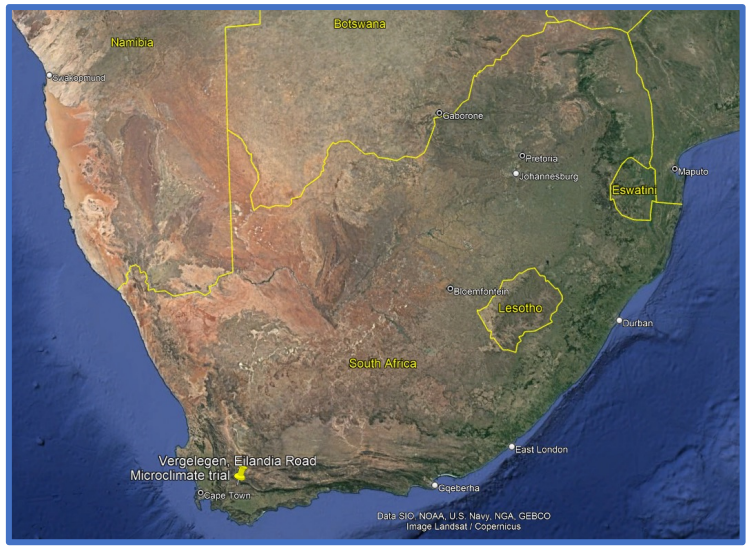
Aims and objectives

- Challenging conditions
- Quality – How can consumer insights aid?
- Aimed to determine the sensory variables that could be used to indicate Crimson Seedless grape quality when different amounts of irrigation water were applied under open field (OF) conditions and underneath overhead plastic covering (OPC)
- Objective to understand table grape sensory quality parallel to external factors affecting the value chain



Materials and Methods



- Crimson seedless / Ramsey
- Stony loam-sand
- Sprinklers 32 L/h
- 1.75m x 3m planting width
- Pergola

Open Field and OPC		
Water Treatment (amount measured)	**Ripeness level ***	**Storage duration for each ripeness level**
W100 (Commercial practice) **W080** **W070** **W055**	R1 = 83 Days after full bloom (DAFB) R2 = 90 DAFB R3 = 97 DAFB R4 = 104 DAFB R5 = 111 DAFB	S1 = 4 weeks @ -0.5°C + 1 week @ 7.5°C S2 = 8 weeks @ -0.5°C + 1 week @ 7.5°C

*Department of Agriculture Forestry and Fisheries (DAFF, 1990)

Irrigation scheduling: ET_0 & crop factor (Commercial practice)

Materials and Methods

Harvest grapes, pack 2 X 4.5 kg cartons per treatment per replicate

Grapes sampled after storage (S1 & S2)

Visual evaluation on a representative sample of pieces of bunches from each carton per treatment per replicate per storage time

Eating quality evaluation: Tasters each received a container with a representative sample of the berries in each carton

Eight to ten tasters

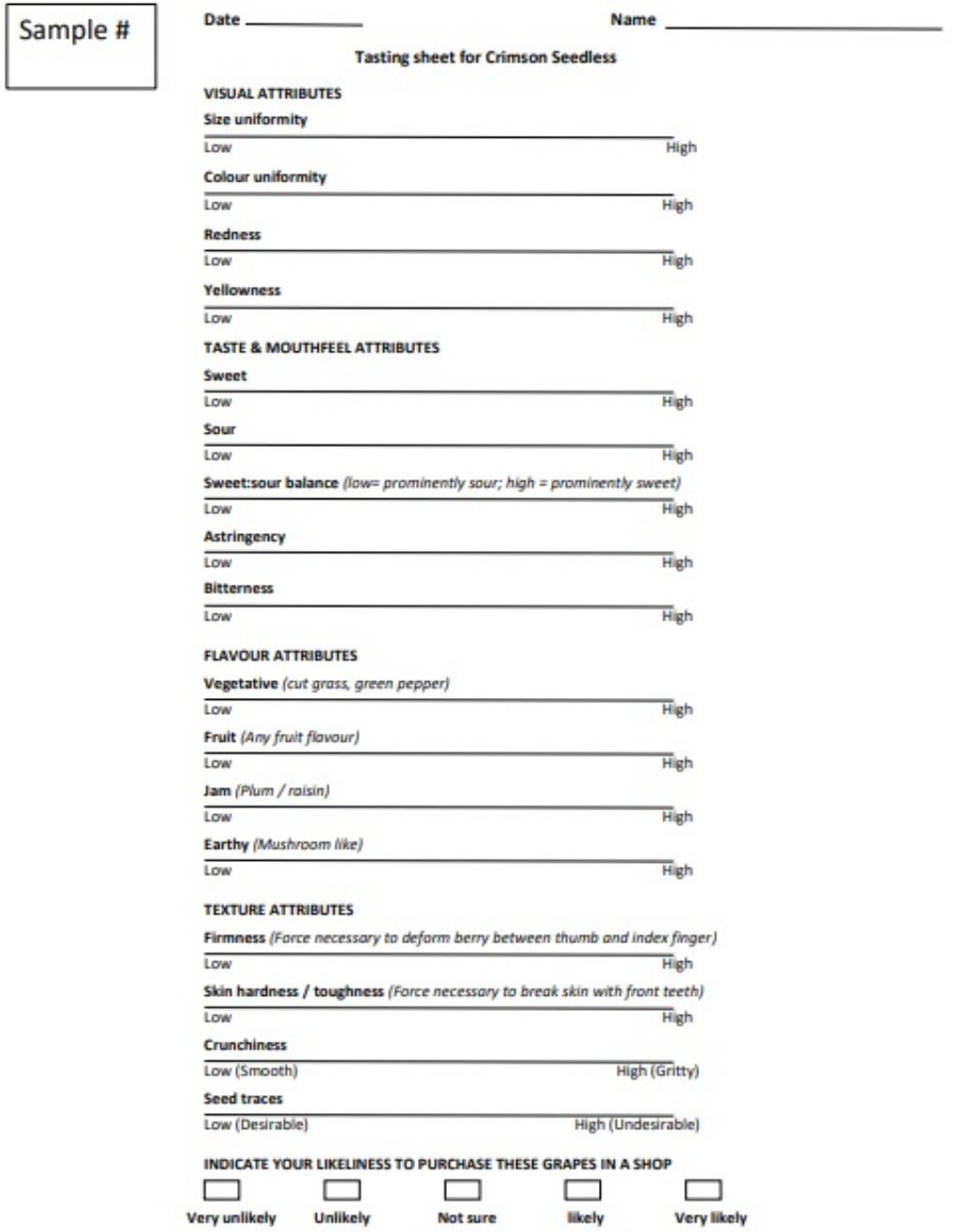
Panel calibration training

Statistical analyses: SAS software (Version 9.4; SAS Institute Inc, Cary, USA)

Juice analyses

Volatile compounds (Gas Chromatography)

Texture analyses (Fruit texture analyser, 3mm compression, 10mm/s measure speed, 0.98N)



Sample #

Date _____ Name _____

Tasting sheet for Crimson Seedless

VISUAL ATTRIBUTES

Size uniformity
Low — High

Colour uniformity
Low — High

Redness
Low — High

Yellowness
Low — High

TASTE & MOUTHFEEL ATTRIBUTES

Sweet
Low — High

Sour
Low — High

Sweet:sour balance *(low= prominently sour; high = prominently sweet)*
Low — High

Astringency
Low — High

Bitterness
Low — High

FLAVOUR ATTRIBUTES

Vegetative *(cut grass, green pepper)*
Low — High

Fruit *(Any fruit flavour)*
Low — High

Jam *(Plum / raisin)*
Low — High

Earthy *(Mushroom like)*
Low — High

TEXTURE ATTRIBUTES

Firmness *(Force necessary to deform berry between thumb and index finger)*
Low — High

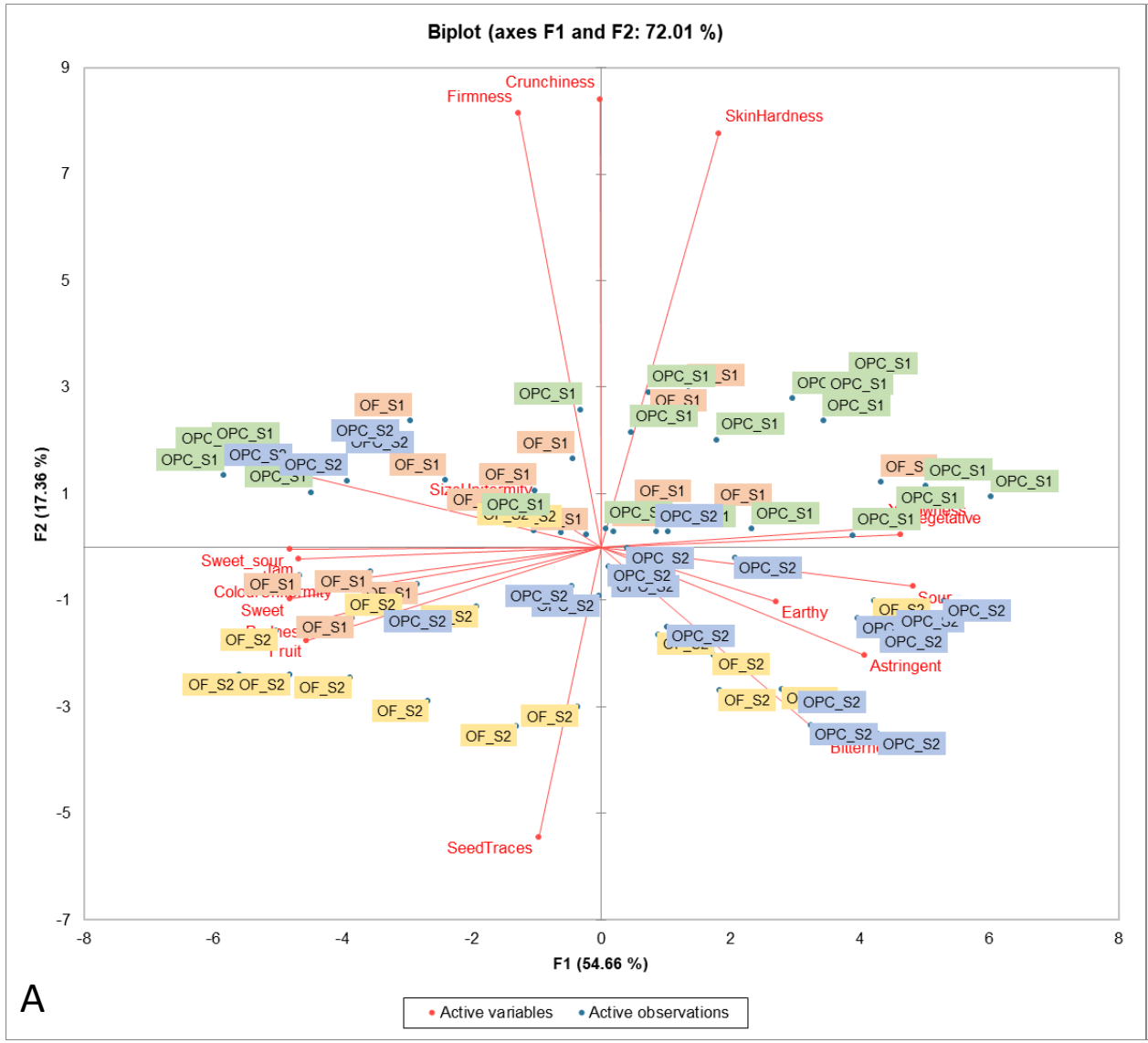
Skin hardness / toughness *(Force necessary to break skin with front teeth)*
Low — High

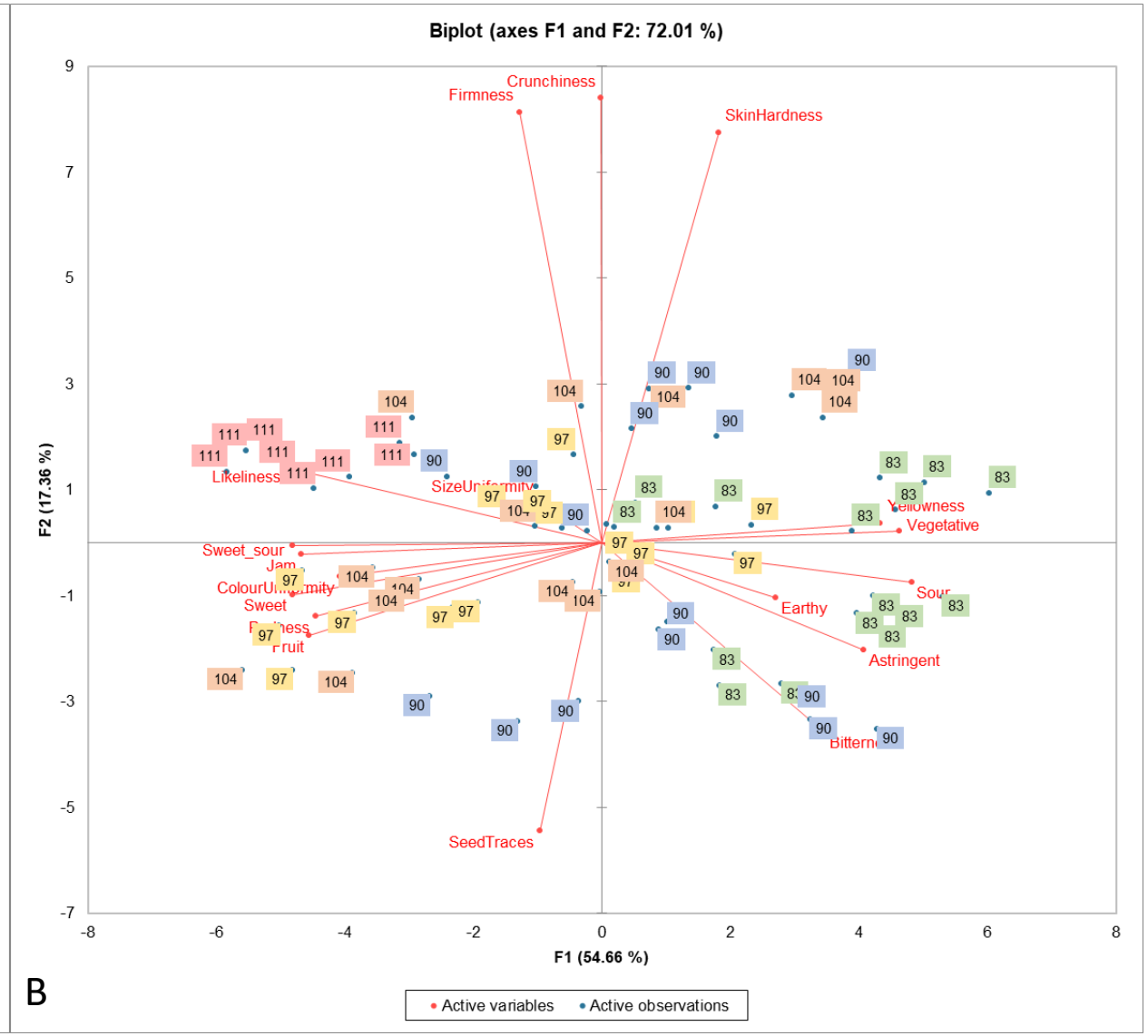
Crunchiness
Low (Smooth) — High (Gritty)

Seed traces
Low (Desirable) — High (Undesirable)

INDICATE YOUR LIKELINESS TO PURCHASE THESE GRAPES IN A SHOP

☐ Very unlikely ☐ Unlikely ☐ Not sure ☐ likely ☐ Very likely

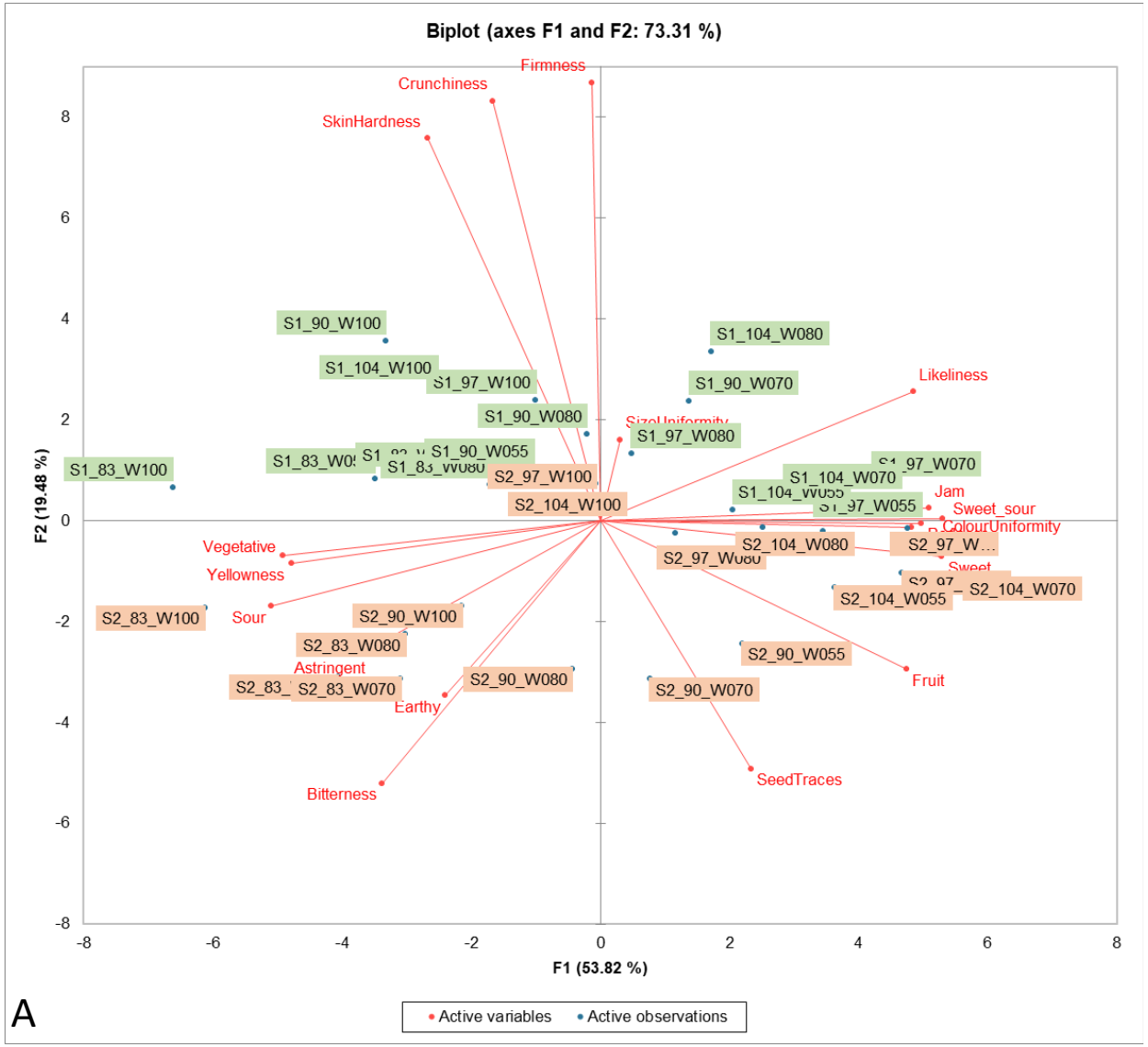




PCA biplot of 22/23 sensory data for both climates, all DS and storage

Development stage 83 = R1, 90 = R2, 97 = R3, 104 = R4, 111 = R5

Open Field



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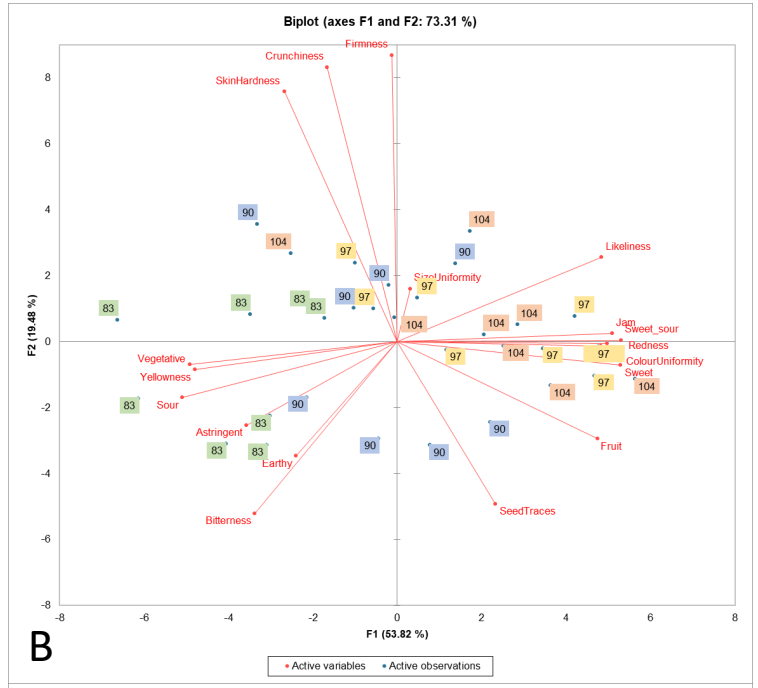
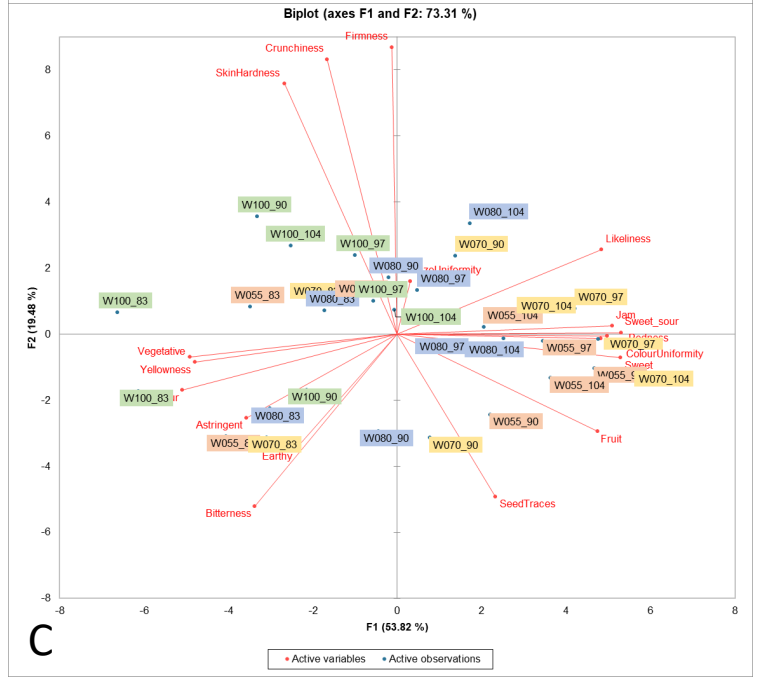
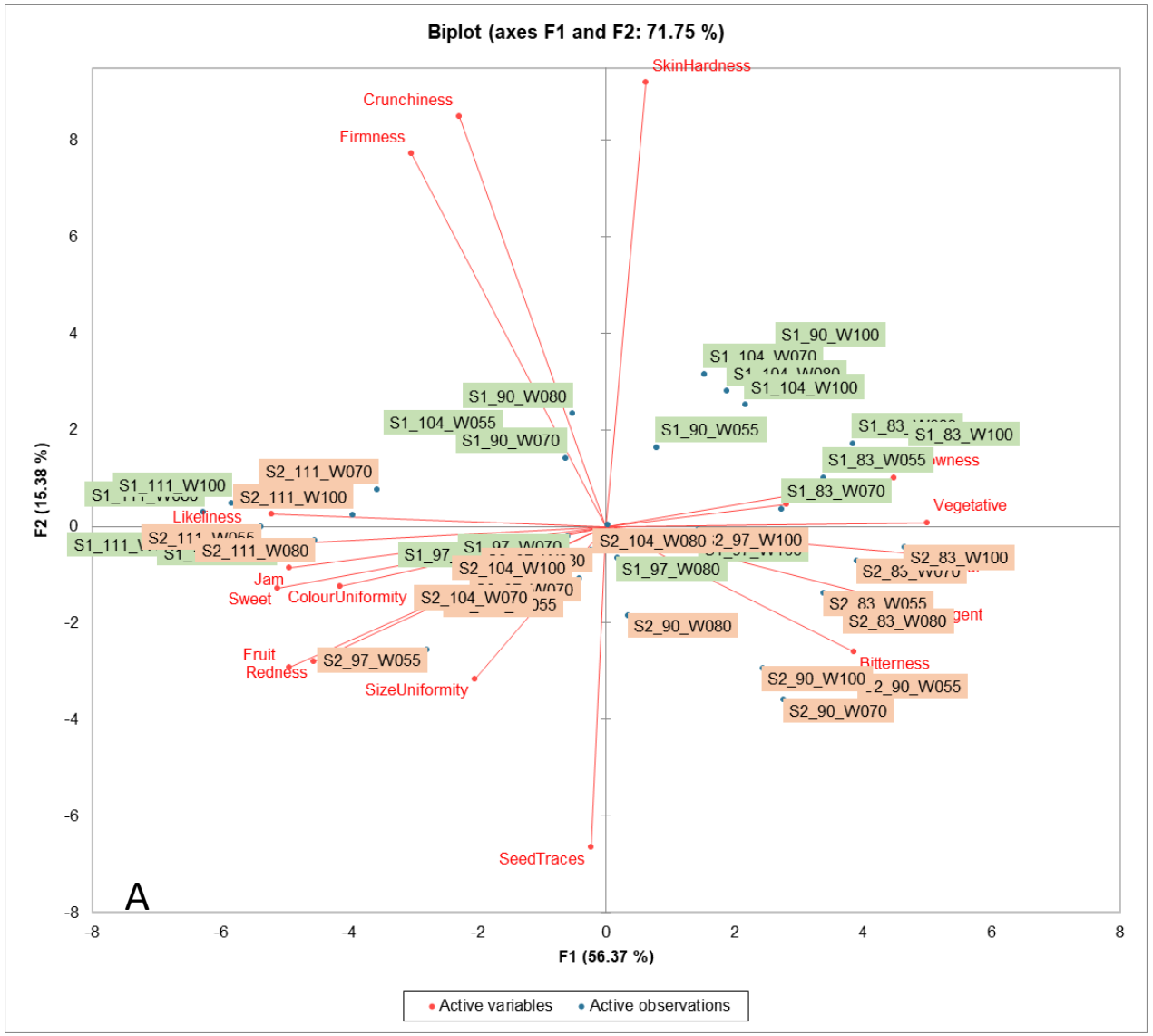




PCA biplot of 22/23 sensory data for OF, all DS, storage and Trt

Overhead Plastic Covering



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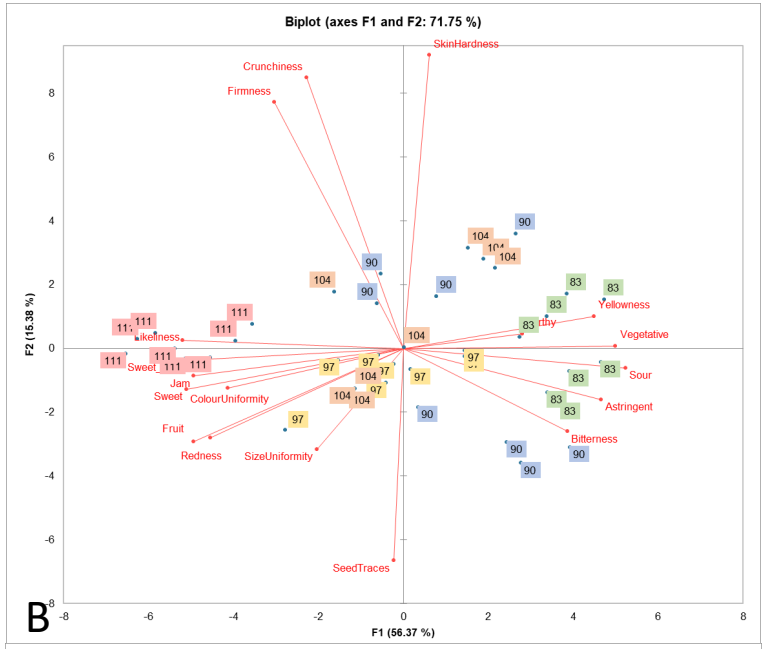
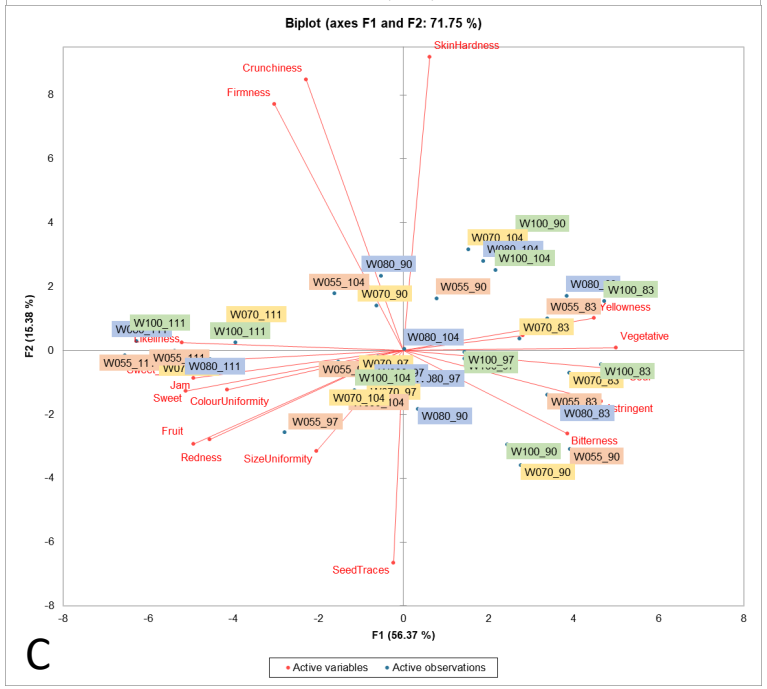
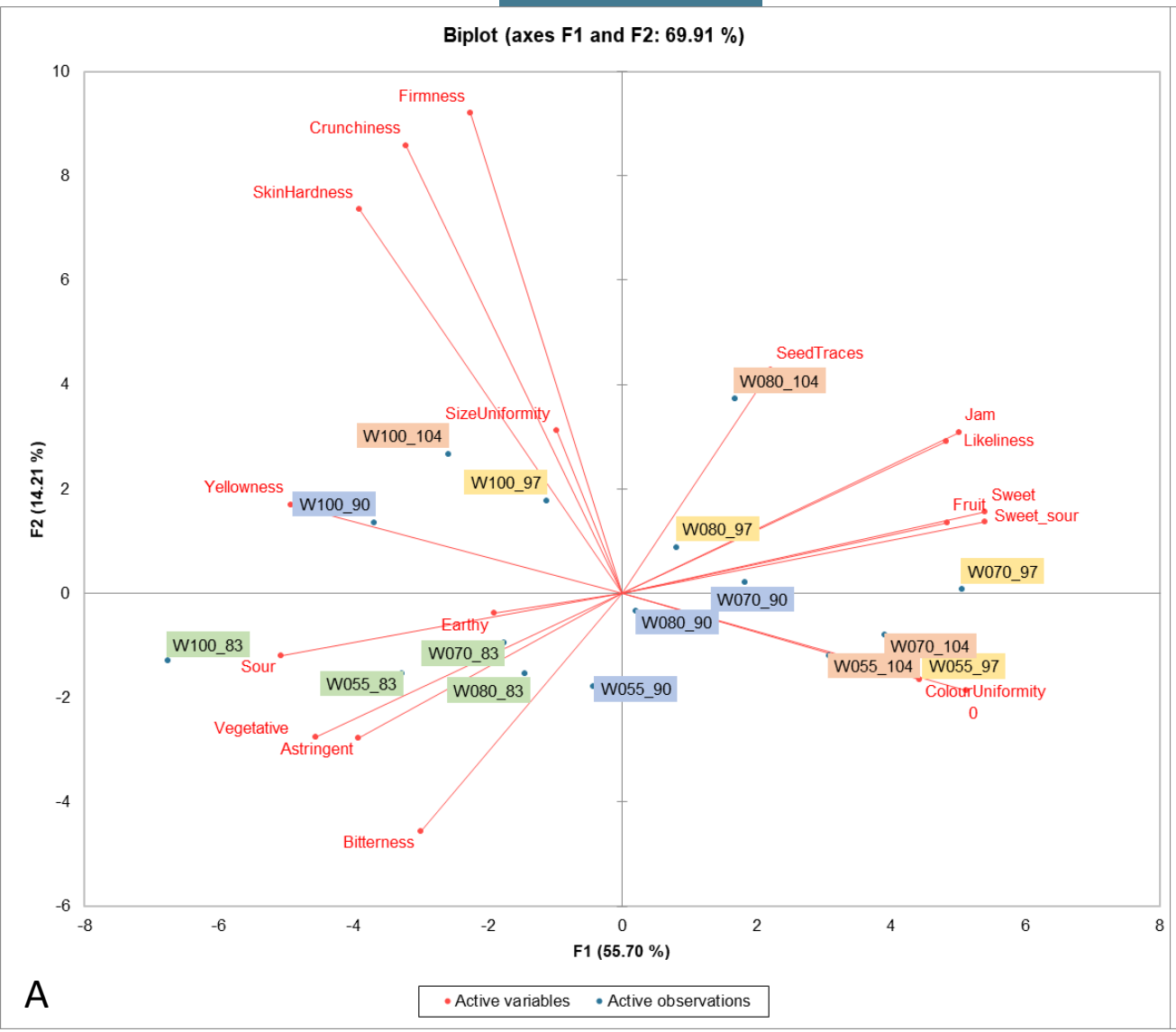




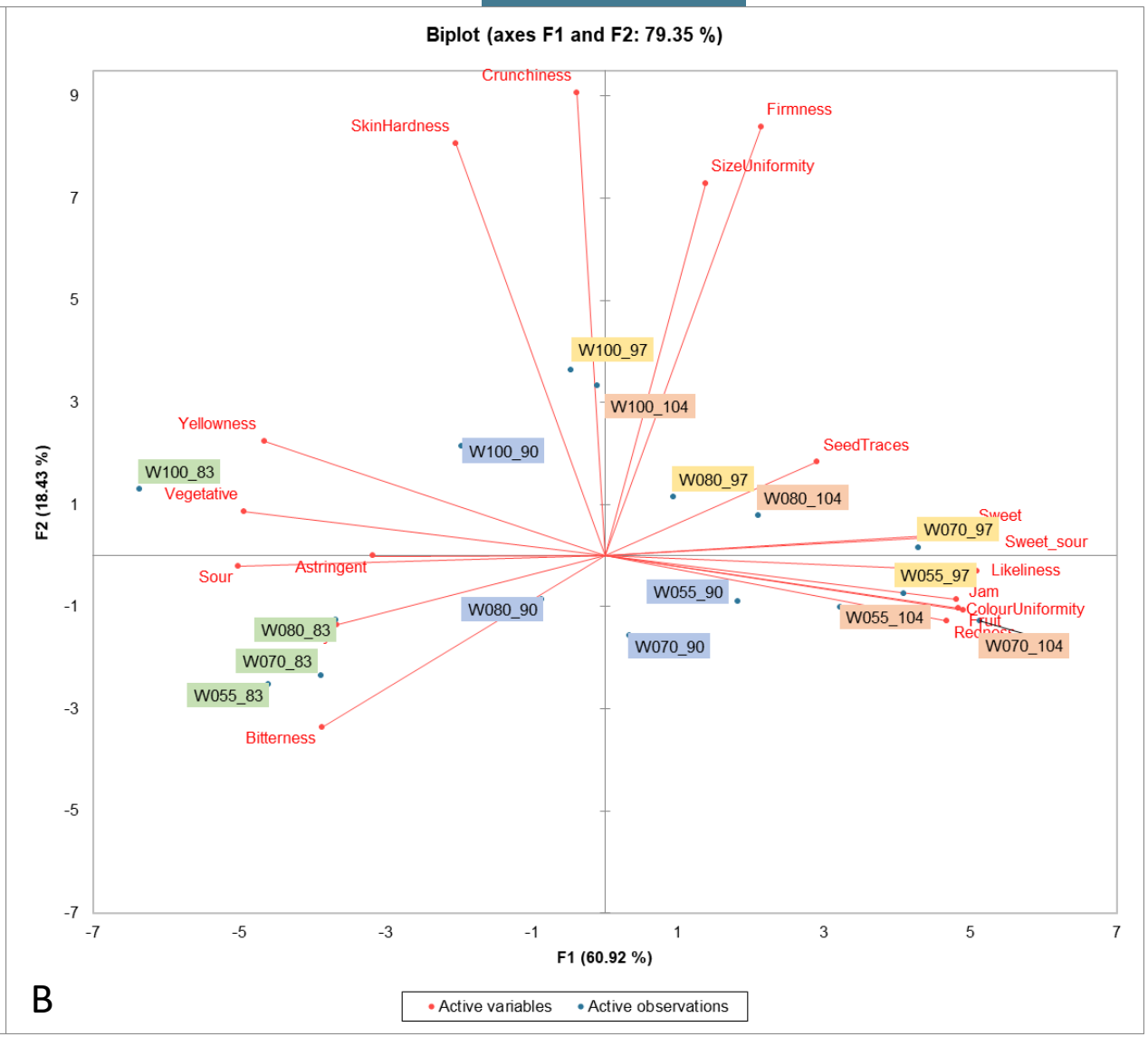
PCA biplot of 22/23 sensory data for OPC, all DS, storage and Trt

Open Field S_1



A

Open Field S_2

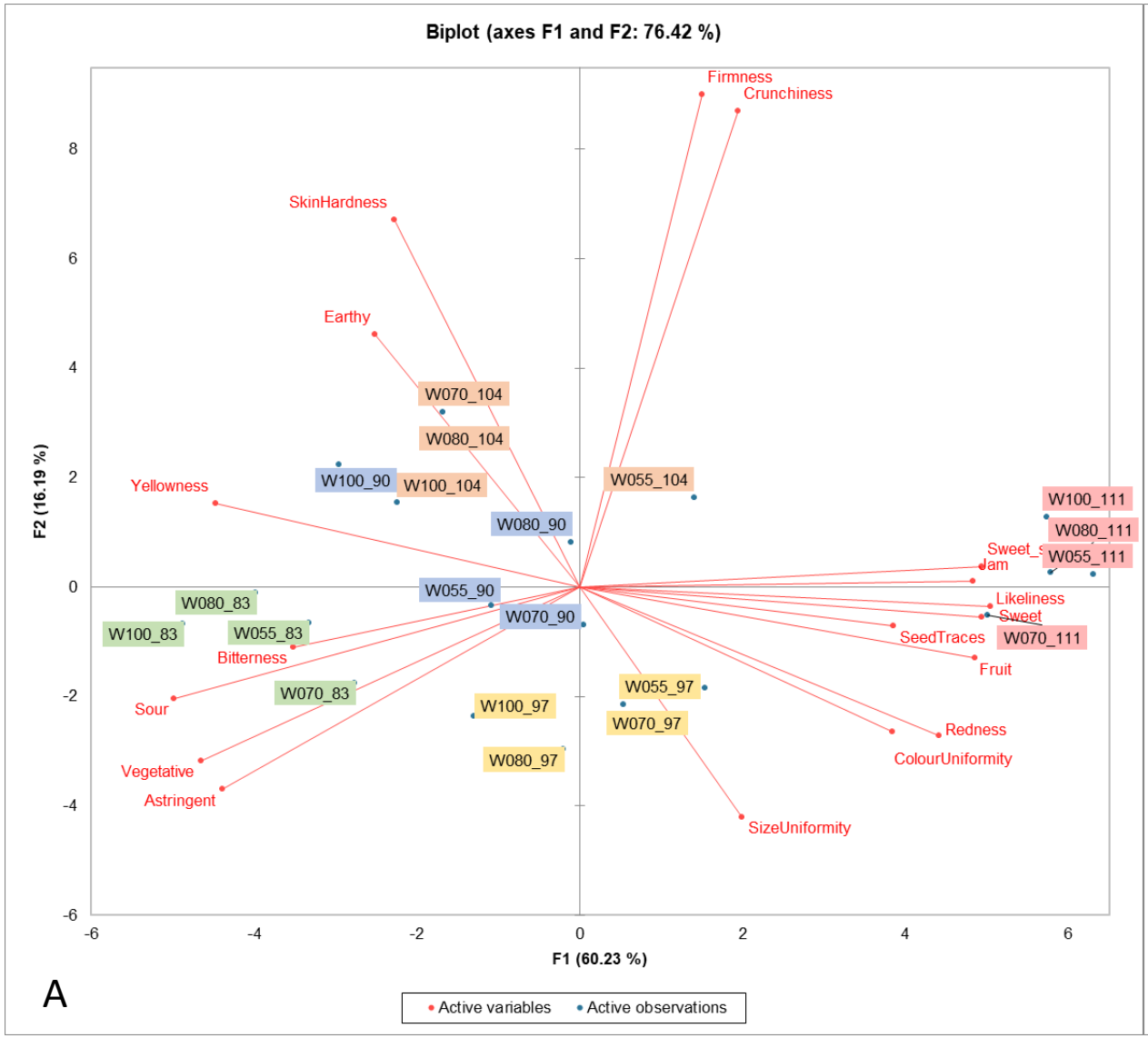


B

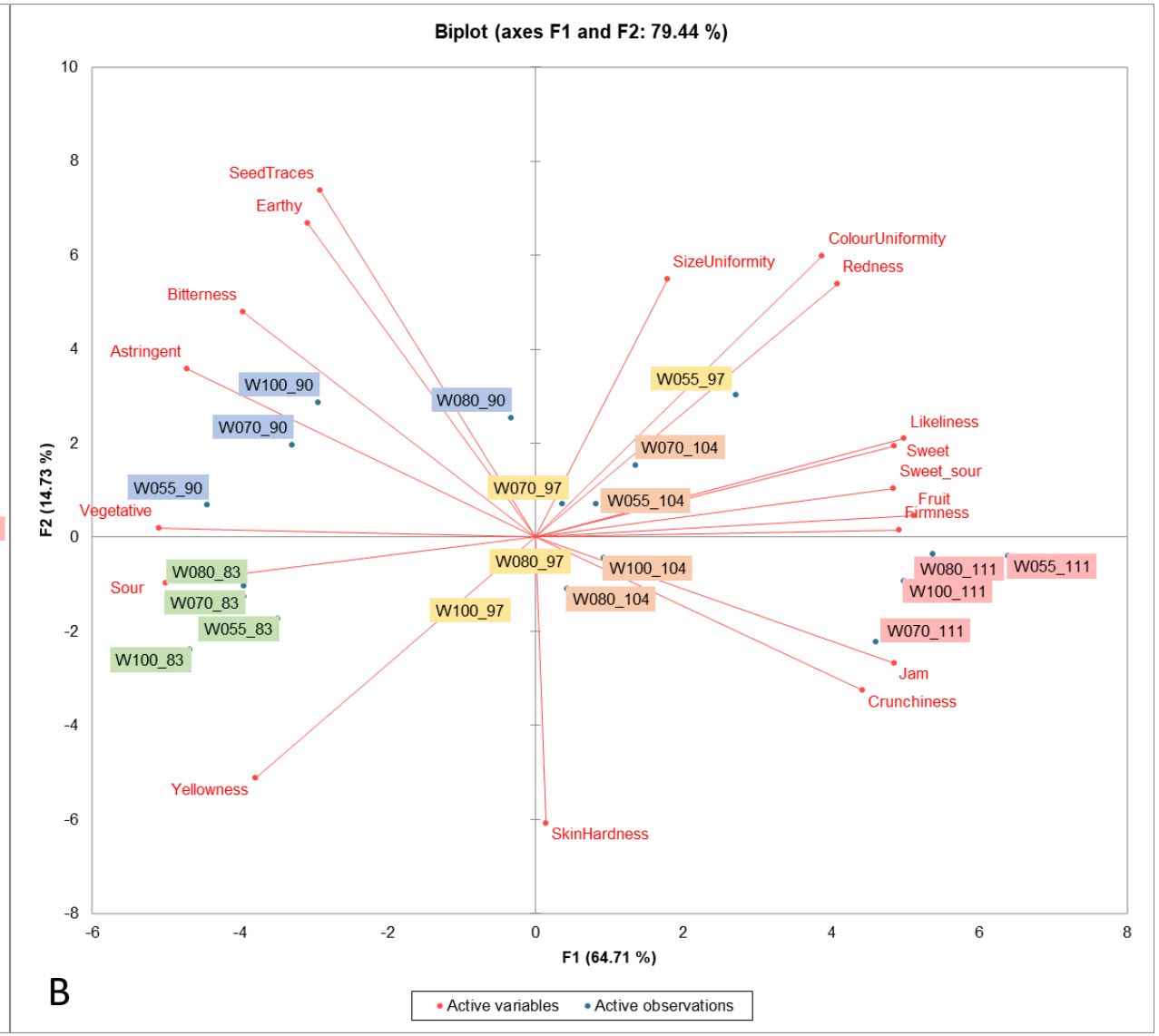
Development stage 83 = R1, 90 = R2, 97 = R3, 104 = R4, 111 = R5

PCA biplots of 22/23 sensory data for OF, all DS and Trt for each storage separately

Overhead Plastic Covering S_1



Overhead Plastic Covering S_2



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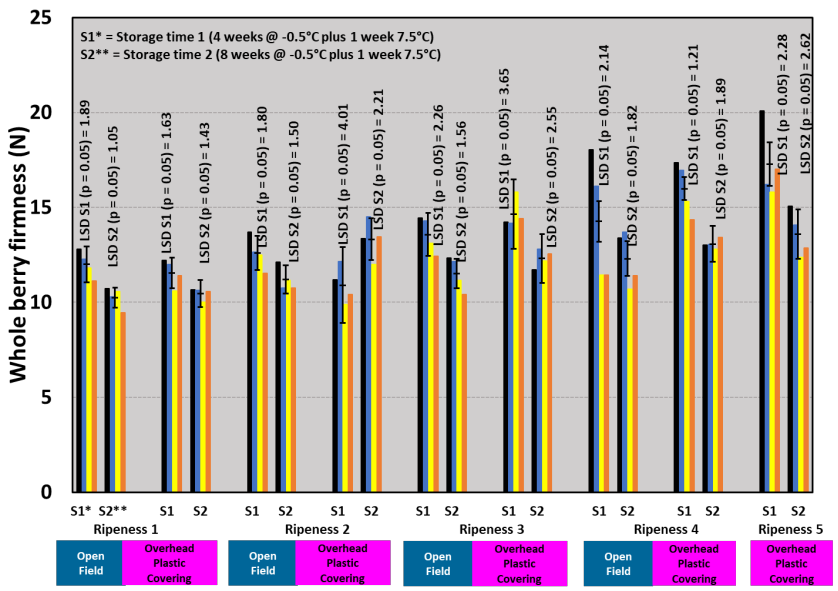
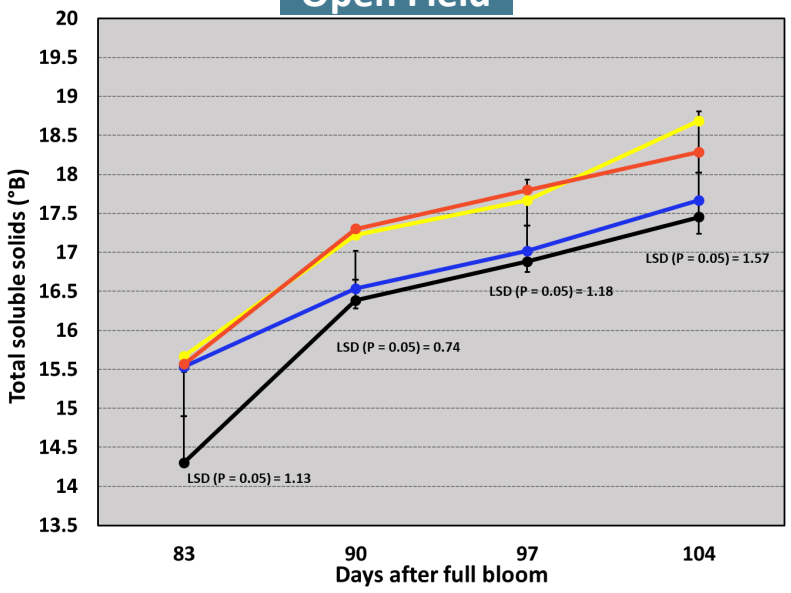
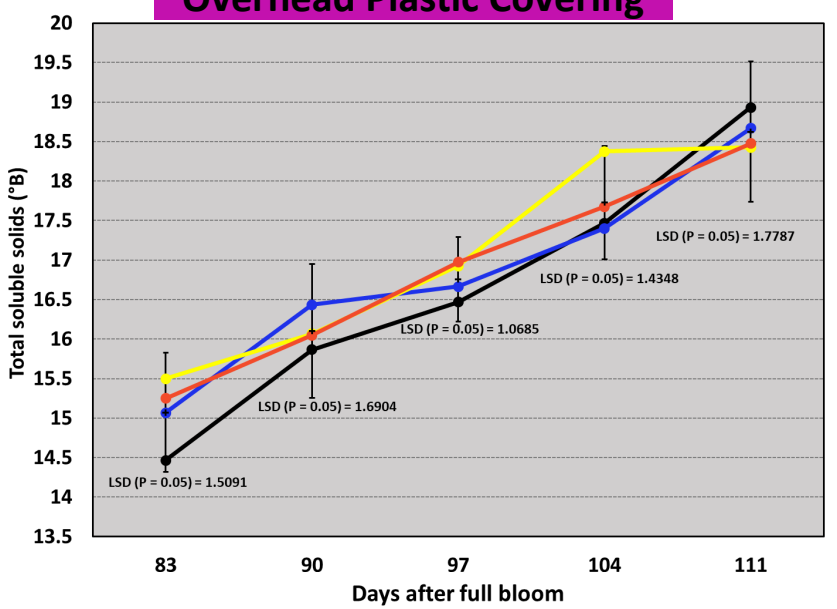


Open Field

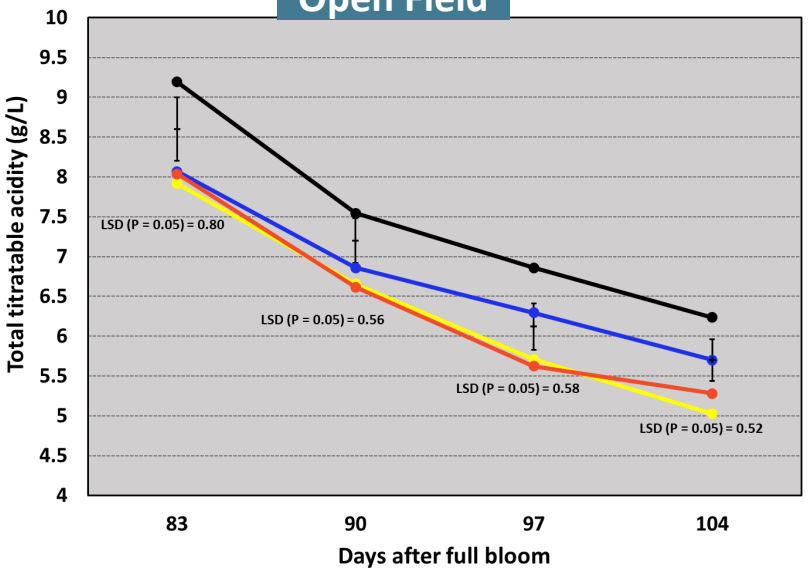


Overhead Plastic Covering

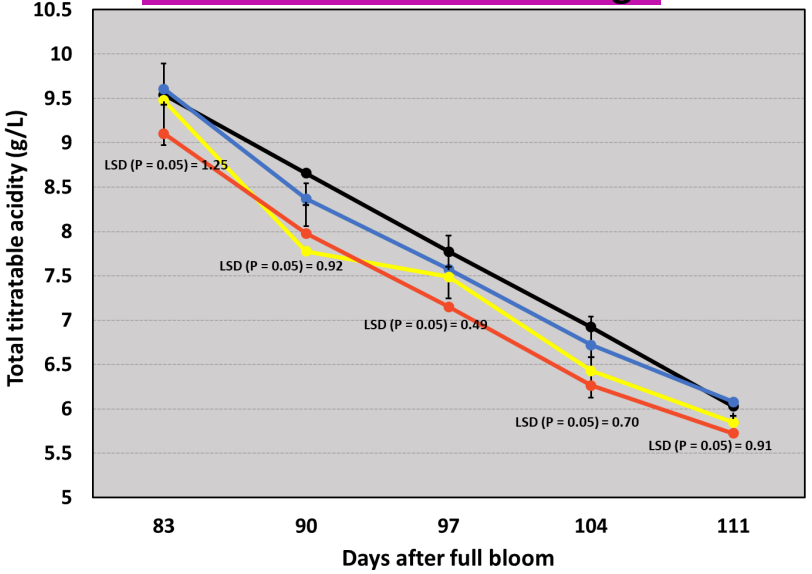


W100 W080 W070 W055 + LSD

Open Field



Overhead Plastic Covering



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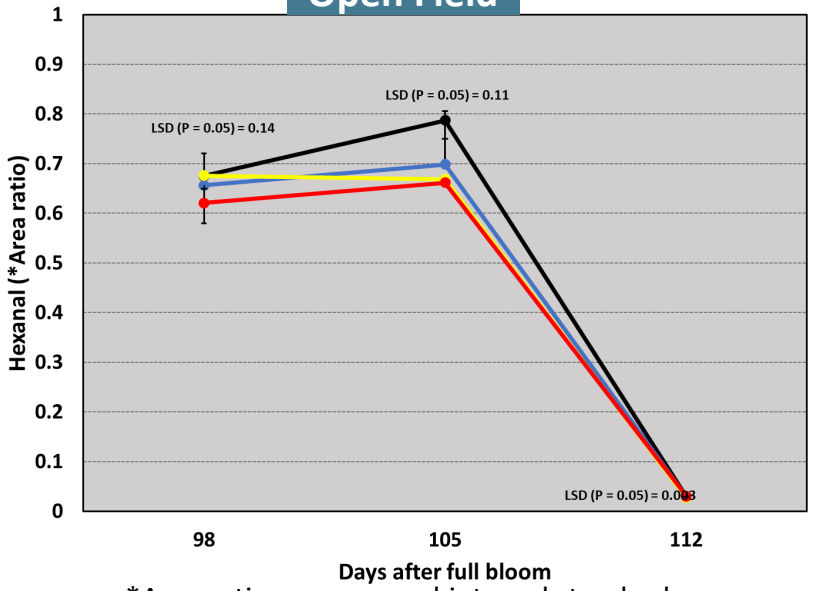

*Area ratio = compound:internal standard

Conclusions

Grapes from a lower ripeness level are low in positive attributes, whereas grapes from higher ripeness levels are high in positive attributes

Sweetness correlated positively with likeliness to buy and acidity, astringency, bitterness and vegetative correlated negatively

Sweetness is expected to be a driver for preference for a neutral cultivar like Crimson Seedless

The results of the sensory evaluations for the previous seasons must be taken into account to confirm the observations

Sensory evaluation reflected grape quality similar to measurements and analyses

For the 2022/2023 season, sensory evaluation gave a good reflection of the quality of grapes grown under different climatic conditions and with different amounts of water

Acknowledgements

ARC Infruitec-Nietvoorbij staff