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Influence of different fertilization regimes on avocado fruit mineral composition in Bay of Plenty, New Zealand

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Background

NZ Avocado: Premium quality

Main challenge:
Avocado fruit rots

Copper-based fungicides

Orchard management

Fruit Ca status

Ca concentration
N:Ca
Ca+Mg:K

Scion/Rootstock genetic:
Rootstock filter effect

Nutritional Management:
Soil Ca management
N and K Fertilization

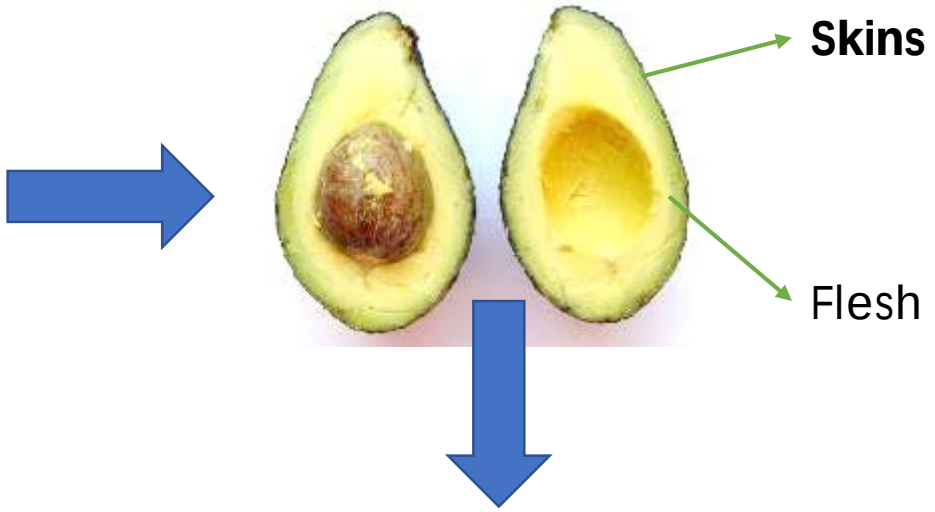
The aim is to explore the influence of fertilization regimes of high-performance avocado orchards on the fruit mineral composition

Methodology

Monitoring fruit and soil mineral composition:

Early harvest in September 2021: Average flesh dry matter (~ 24%)

Late harvest in January 2022: Average flesh dry matter (~33%) (***High incidence of fruit rots***)



Mineral composition: Ca, K, Mg, N, P

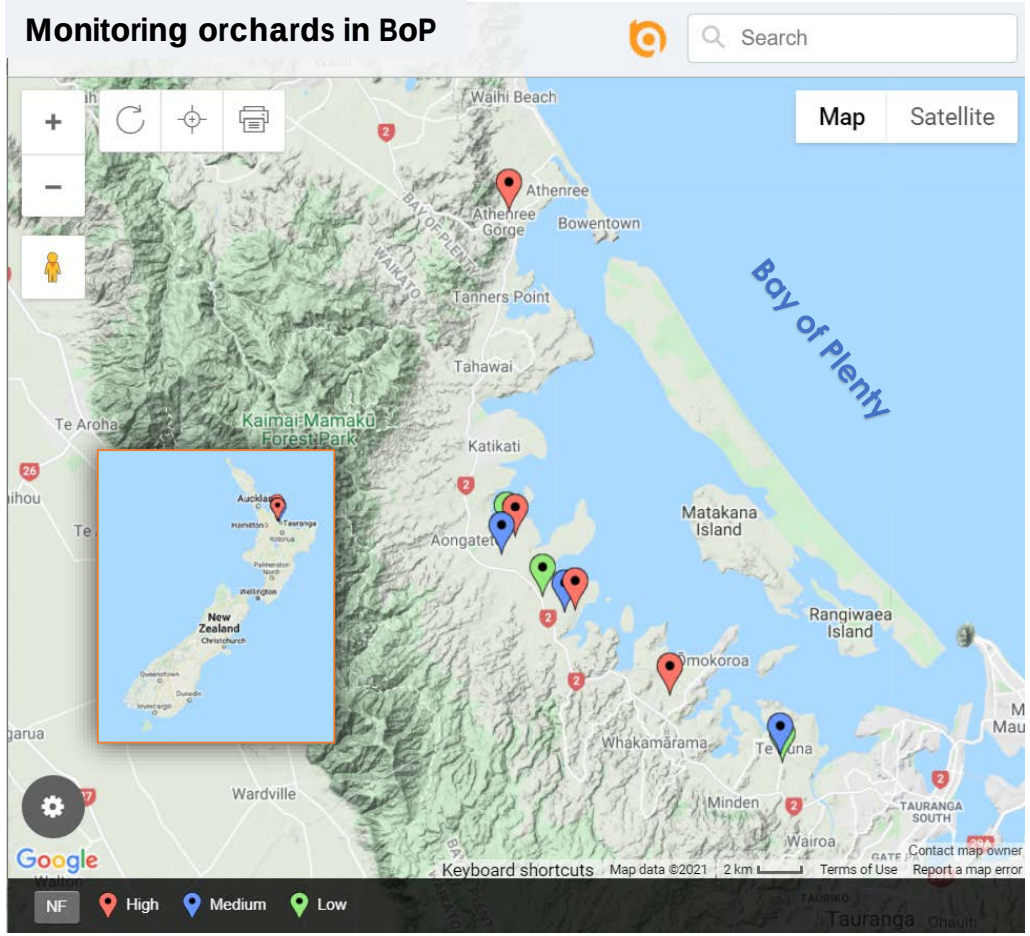
Methodology

Survey of 9 commercial avocado orchards in the Bay of Plenty (BoP), New Zealand

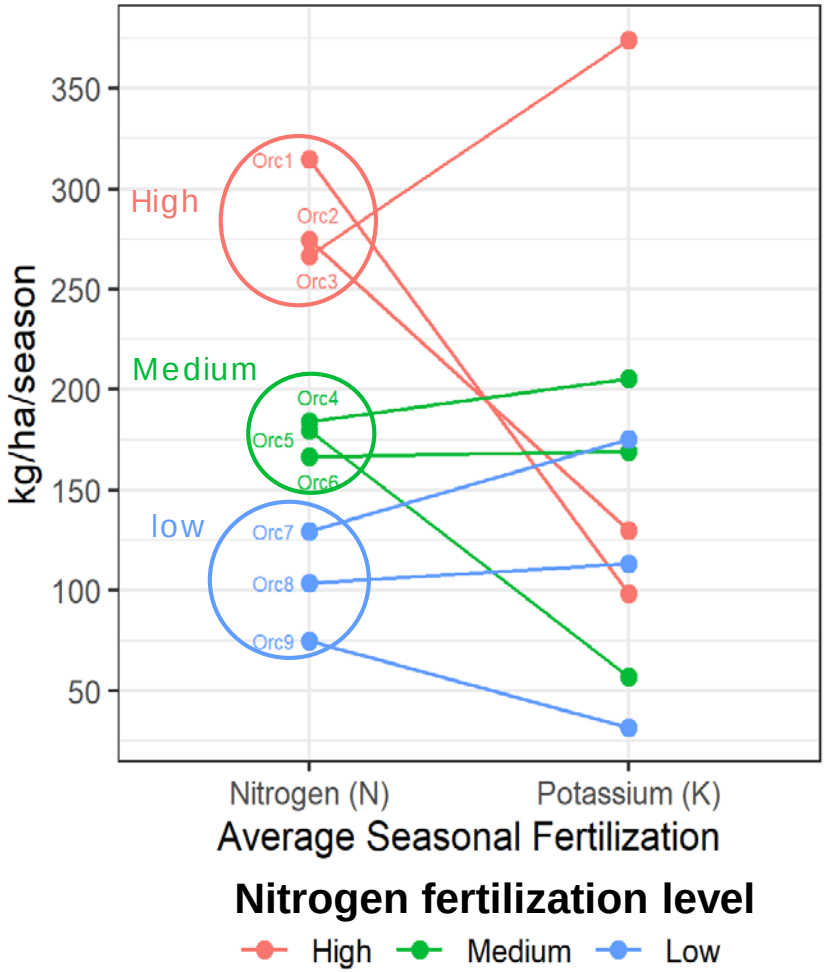
- Orchards located on well-drained *Typic Orthic Allophanic* soils
- High Yield (>16 t/ha during last 3 seasons 2017-2018, 2018-2019, 2019-2020)
- Hass on Zutano trees
- Adult trees (>15 years old) and similar biomass

3 orchards by each level of nitrogen fertilization (NF):

- High: >250kg N/ha/season
- Medium: 150 to 250kg N/ha/season
- Low: < 150kg N/ha/season

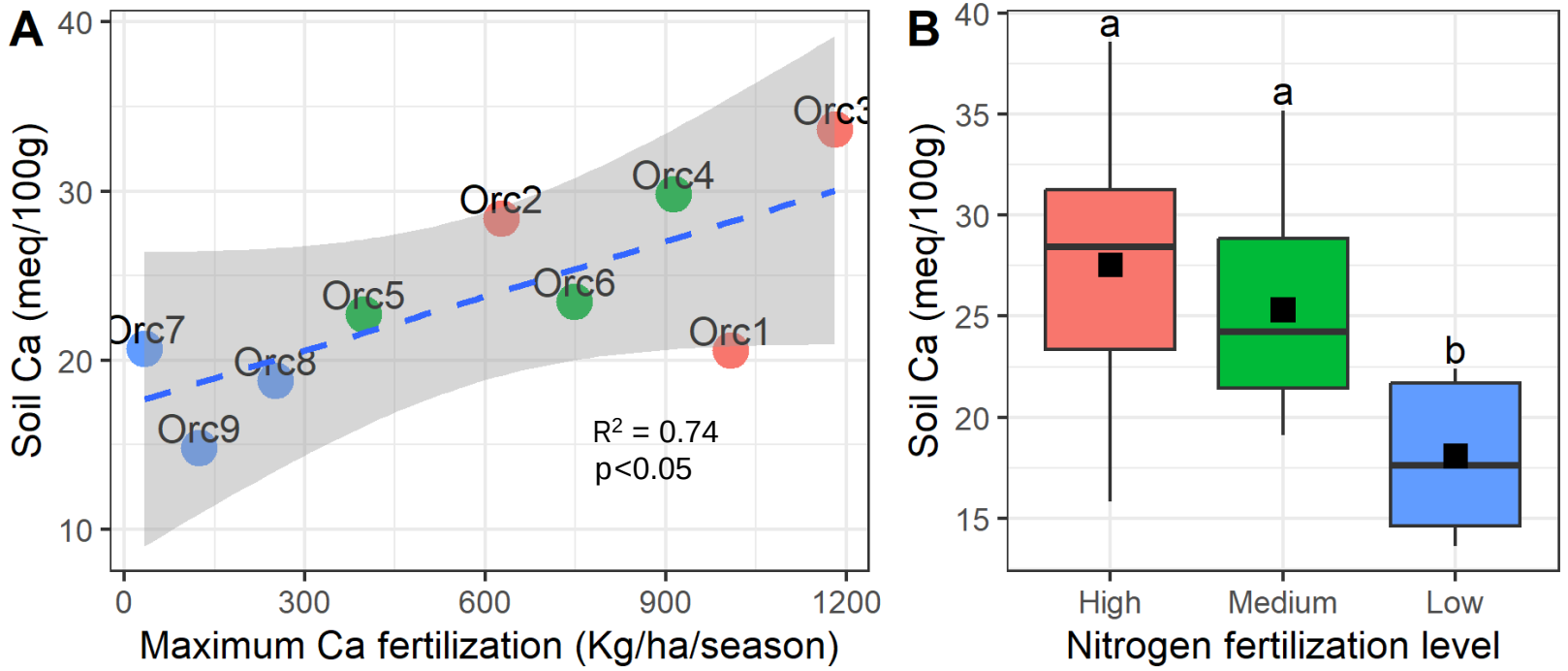


Results:
Average N and K fertilization used in monitored orchards



- Orchards using high N fertilization do not always use high K fertilization.
- There is a wide range of K fertilization.

Results:
Soil Ca concentration



- Orchards with higher N fertilization used high Ca inputs (Lime and Gypsum supported up to 96% Ca inputs)
- Soil Ca concentration is positively related to Ca fertilization
- There was a high Ca concentration in all monitored orchards (12meq Ca/100g is the soil fertility target set by the NZ avocado industry**)

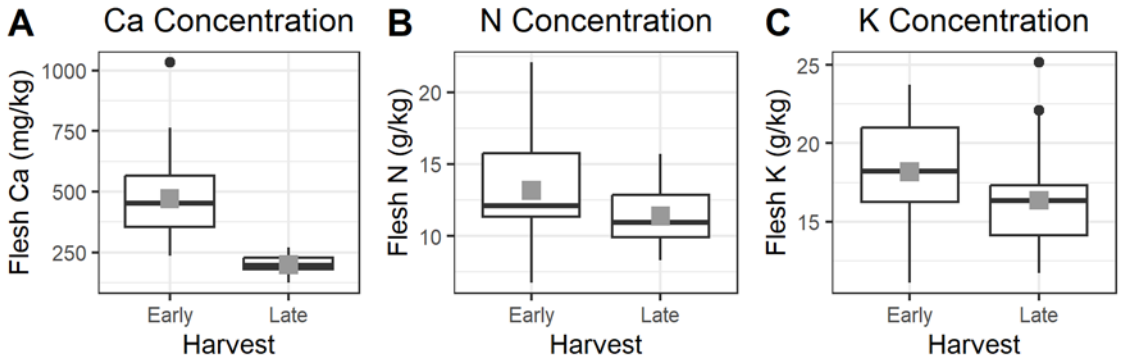
*Maximum calcium fertilization by season in the last three seasons (Generally the season when soil pH is adjusted)
** NZ avocado grower's manual (2000)

Results:
Fruit Ca status (Early vs Late Harvest)

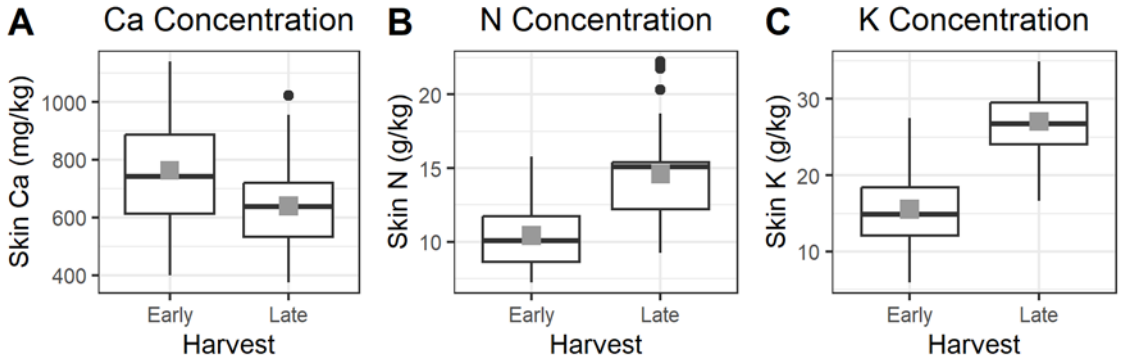
Photo credit: AVOCO Newsletter October 2020

https://www.avoco.co.nz/category/avoco-newsletter/

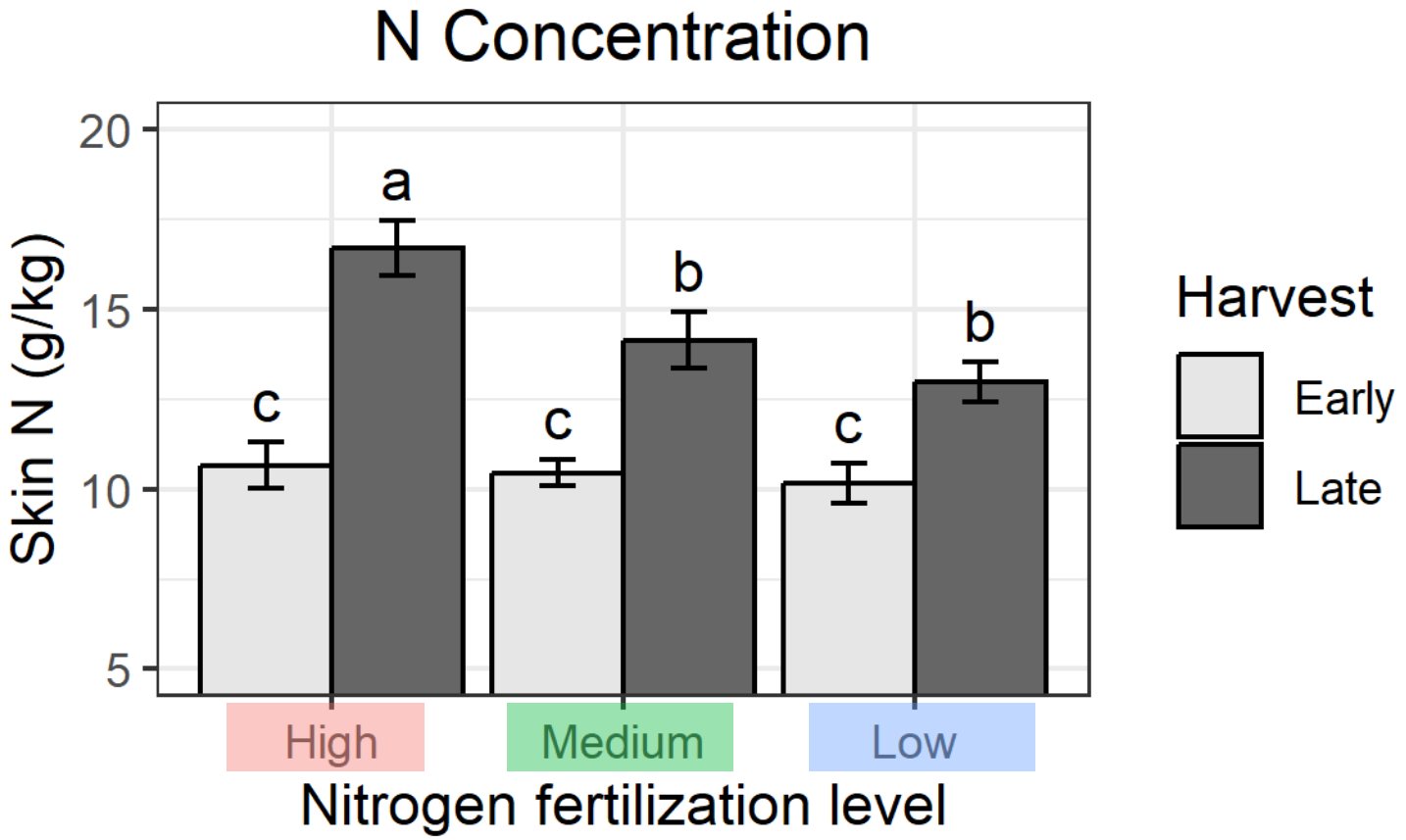
Flesh nutrient status



Skin nutrient status



Results:
Changes in fruit skin N concentration

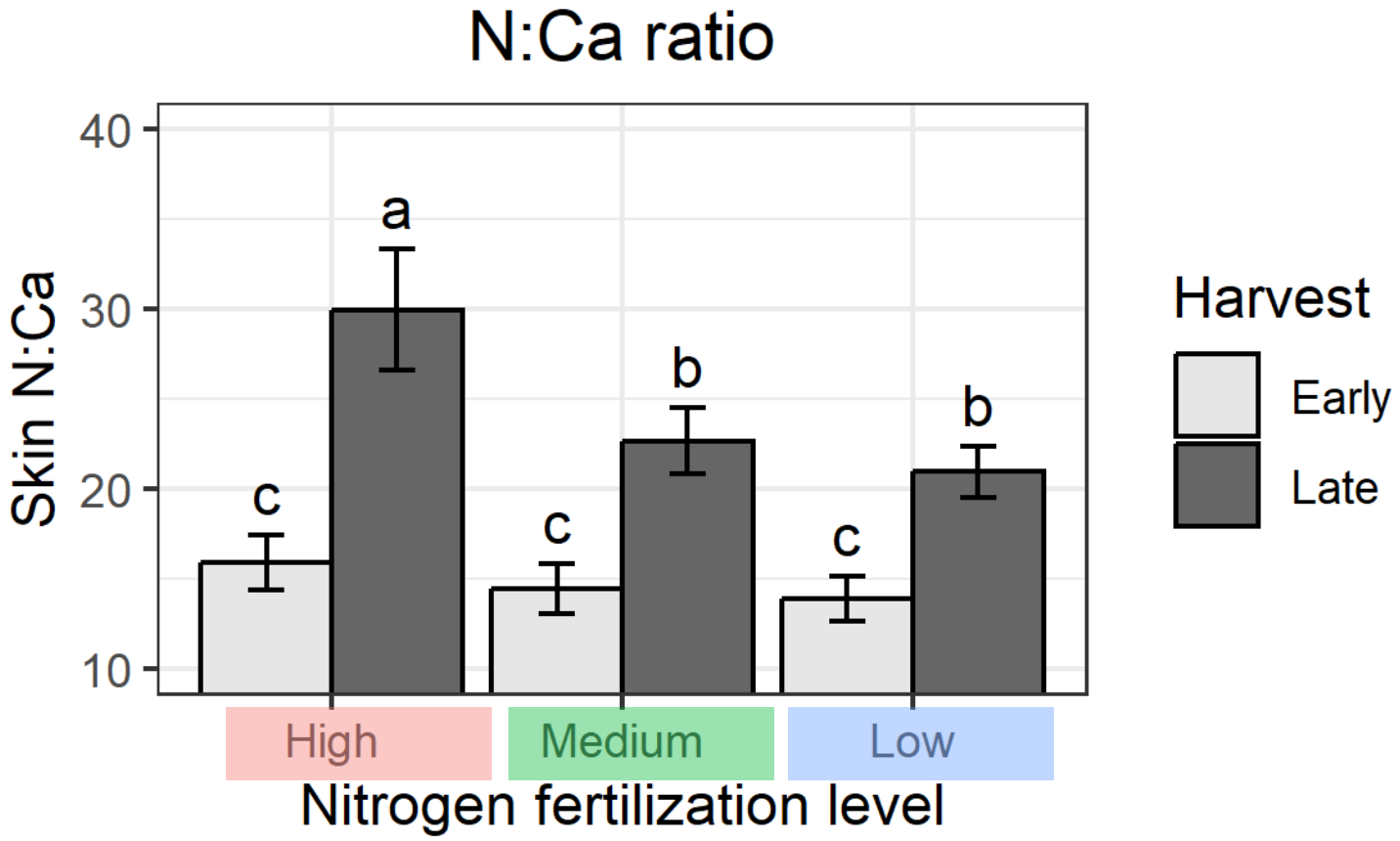


Orchards using high fertilization rates tend to accumulate more N in fruit skins at late harvest

Results:
Changes in fruit skin Ca concentration

N fertilization level did not change fruit skin Ca concentration at early or late harvest

Results:
Changes in fruit skin N:Ca ratio



The ratio N:Ca in fruit skins increased with high N fertilization at the late harvest when FQ disorders are prevalent in New Zealand.

Results:
Exploring the K fertilization influence on fruit skin Ca concentration

High K fertilization reduced fruit skin Ca concentration at late harvest.
Further research with contrasting K fertilizer levels is required to confirm this trend.

Conclusions

- Avocado orchards of BoP use a wide range of fertilizer inputs, influencing fruit nutrient status.
- Orchards with high N fertilizer use showed higher skin N:Ca ratio at late harvest. Therefore, careful management of N fertilizer use may be necessary for influencing fruit nutrient status.
- Ca in fruit skins did not increase with the higher soil Ca concentration in the orchards monitored
- Two nutritional management strategies have been tested in a replicated two-season trial in BoP:
  - To test different combinations of N and K fertilizer rates
  - To reduce the use of K fertilization during early fruit-set

Acknowledgments

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Questions

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