Report

Prepared for

Mangatawhiri Squash Packers Limited

by

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Fruit Nutrient Analysis

The skin and flesh of Buttercup Squash was analysed for nutrient content, to determine if there was a correlation between nutrient levels of Squash fruit and lesion development.

Introduction

Buttercup squash have been noted to develop distinctive lesions on the fruit surface during storage. This was first noted in 1992 and has been documented in 1992 - 1994 seasons. Lesions have predominantly been found on fruit grown in the Mangatawhiri / Hauraki Plains areas.

Various types of lesions were observed -

- ringed circle around a depressed brown centre
- 1 - 2 mm raised lesion, sometimes the centre was depressed and brown.
- Fruit over 10 days old often showed raised lesions with calloused, corky sides, 2 - 4 mm high

Seldom seen at packing, the symptoms have tended to develop on fruit held in storage for more than 7 days after harvest, prior to shipping. The 1994 shipping schedule allowed for fruit to be harvested and held in storage for 7 days or more prior to shipment, whereas in previous years, the time from harvest to shipment was approximately 5 days, and development of lesions was less noticeable.

Soil Types and Lesion Development

Buttercup Squash grown in Hastings and in Mangatawhiri by Mark Holmes, on a river silt loam / heavy clay loam, did not appear to develop lesions during the 1994 season.

A small number of Squash grown on Torehape A developed lesions in the 1994 season. Torehape A soil is a deep, developed, mineral peat.

Squash grown on Maukoro 2 developed significant numbers of lesions on the fruit and were unacceptable for export. The number of Maukoro 2 fruit developing lesions exceeding export standards, was commercially unacceptable. Maukoro 2 soil is a fibrous peat.

Squash stored at the wharf (average 24° C) seemed to rapidly develop large numbers of lesions which were unacceptable for export.

Crop Growth

There appear to be no noticeable symptoms on the plant or fruit prior to harvest. Crops from Torehape A and Maukoro 2 were healthy and appeared normal during crop growth.

Fruit Selection

The following fruit were selected for analysis:

1 A Hastings :
Healthy fruit (no lesions had been found on fruit grown on this property in Hastings)

1 B :
Squash stored at the wharf at 24o C, showing lesions:

- sample from a lesion
- sample from healthy skin on this fruit

2 A :
Squash from Maukoro 2 block, showing lesions

- sample from a lesion
- sample from healthy skin on this fruit

2 B :
Squash from Maukoro 2 block, showing no lesions (healthy fruit)

3 A :
Squash from Torehape A block showing no lesions (healthy fruit)

4 A :
Squash from Holmes block, healthy fruit (no lesions had been found on fruit from this property)

Hastings and Holmes squash were considered to be the control fruit for this analysis.

Results

No obvious trends were seen in fruit flesh samples.

Skin Results

Nitrogen:
Healthy fruit (1A, 2B, 3A, 4A) had a lower nitrogen level compared with fruit showing lesions.

Sulphur:
Healthy fruit (1A, 2B, 3A, 4A) had lower sulphur levels than fruit showing lesions.

Also, the lesion had a higher level of sulphur than non-affected skin on the same fruit.

Phosphorus:
Healthy fruit (1A, 2B, 3A, 4A) had lower phosphorus levels than fruit showing lesions. There was no trend between lesion and non-lesion area on a fruit.

Potassium:
No trend observed.

Calcium:
Calcium levels of the lesions were higher than non-lesioned skin of the same fruit.

Fruit from Maukoro 2 healthy fruit, Torehape A and Holmes, had lower calcium levels than fruit with lesions.

Hastings fruit recorded a high calcium level, of 0.29%

Magnesium:
Magnesium levels of the lesions were lower than non-lesioned skin of the same fruit.

There is no clear trend between lesioned and healthy fruit levels.

Sodium:
The same recording for all fruit.

Iron:
No clear trend.

Manganese:
Manganese levels of the lesions were higher than non-lesioned skin of the same fruit.

There is no clear trend between lesioned and healthy fruit.

Zinc:
Zinc levels of the lesions were higher than non-lesioned skin of the same fruit.
There is no clear trend between lesioned and healthy fruit.

Copper:
No clear trend.

Boron:
Boron levels of the lesions were higher than non-lesioned skin of the same fruit.

Fruit with lesions had higher levels of boron than healthy fruit, except Torehape A at 17 ppm.

Interpretation

Nitrogen, Sulphur, Phosphorus

Nitrogen, sulphur and phosphorus levels are lower in healthy fruit than fruit showing lesions.

This could be a result of higher levels of these elements in a plant-available form in soil in the Maukoro 2 block, compared to Torehape A, Holmes and Hastings blocks.

Peat soils have the ability to supply nitrogen from organic matter in the soil.

Nitrogen, sulphur and phosphorus levels could be higher in lesioned fruit, due to applied fertiliser levels being higher than required by Squash plants on a fibrous peat soil (Maukoro 2).

Calcium, Manganese, Zinc, Boron

Boron zinc and Manganese mirrored the calcium results; that is, levels were higher in lesions compared to non-lesioned skin of the same fruit.

There could be a movement of calcium, manganese, zinc and boron ions from surrounding tissue into the lesion area. This could possibly be the result of lower than required levels of calcium, manganese and boron in a plant-available form in the Maukoro 2 block.

Manganese levels are often high in water-logged, acidic soils. During the 1993 / 94 growing season, there was no problem with water-logging. The soil moisture levels were below normal.

Areas for Further Research

From these results there was no specific link between nutrient levels of Squash skin and flesh and lesion development on Squash.

The analysis highlighted that:

i) Nitrogen, sulphur and phosphorus levels are higher in lesioned than non-lesioned fruit.

This may be due to excess fertiliser being applied. Future trials should include:

→ reducing the level of applied Nitrogen
→ reducing the level of applied Phosphorus
→ reducing the level of applied Sulphur
→ reducing all 3 elements in the fertiliser programme

ii) Calcium, manganese, boron and zinc levels were higher in the lesions than non-lesioned skin of the same fruit.

If this is due to there being a slight deficiency of these elements, then trials applying extra calcium, manganese, boron and zinc, should be considered.

Manganese and boron are trace elements, so only very small quantities of these elements are required by plants; too much and toxicity levels result. Foliar fertilisers are usually the easiest form to apply trace elements.

Calcium can be applied in the form of lime in base dressings, or as a foliar fertiliser. Timing of the calcium application(s) could be critical. This could be investigated further; particularly applying calcium foliar fertilisers before plants begin running.

It would be necessary to compare plant growth, fruit yield, fruit quality and storage life of Squash from the trial blocks, with Squash grown under the current fertiliser programme, before making significant changes to the fertiliser programme.