COLD TOLERANCE OF VETIVER GRASS

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INTRODUCTION

In Australia, Vetiver growth was not affected by severe frost at –14ºC ground temperature

It survived for a short period at –22ºC (-8ºF) in northern China.

In Georgia (USA), Vetiver survived in soil temperature of -10ºC but not at –15ºC.

Research showed that 25ºC was optimal soil temperature for root growth, but Vetiver roots continued to grow at 13ºC at the rate of 12.6cm/day, indicating that Vetiver grass was not dormant at this temperature

Extrapolation suggested that root dormancy occurred at about 5ºC

Vétiver dies when the crown or ground is frozen

NATURAL RESOURCES

SOME EXAMPLES

- **Survival of Vetiver under severe frost conditions**
- **Survival of Vetiver under snow**
- **Survival of Vetiver under extremely cold and dry desert conditions**
- **Vetiver growth in cold and frost under field conditions**
- **Research results on the effect of low temperature on Vetiver shoot and root growth**

Severe frost (-14^{0}C on ground surface) stopped shoot growth in winter in Australia

Regrowth after 3 months in spring

NATURAL RESOURCES

Los Angeles mountain on the Chilean Andes (Latitude 38 º South)

Vétiver was covered by snow for 2 months during winter

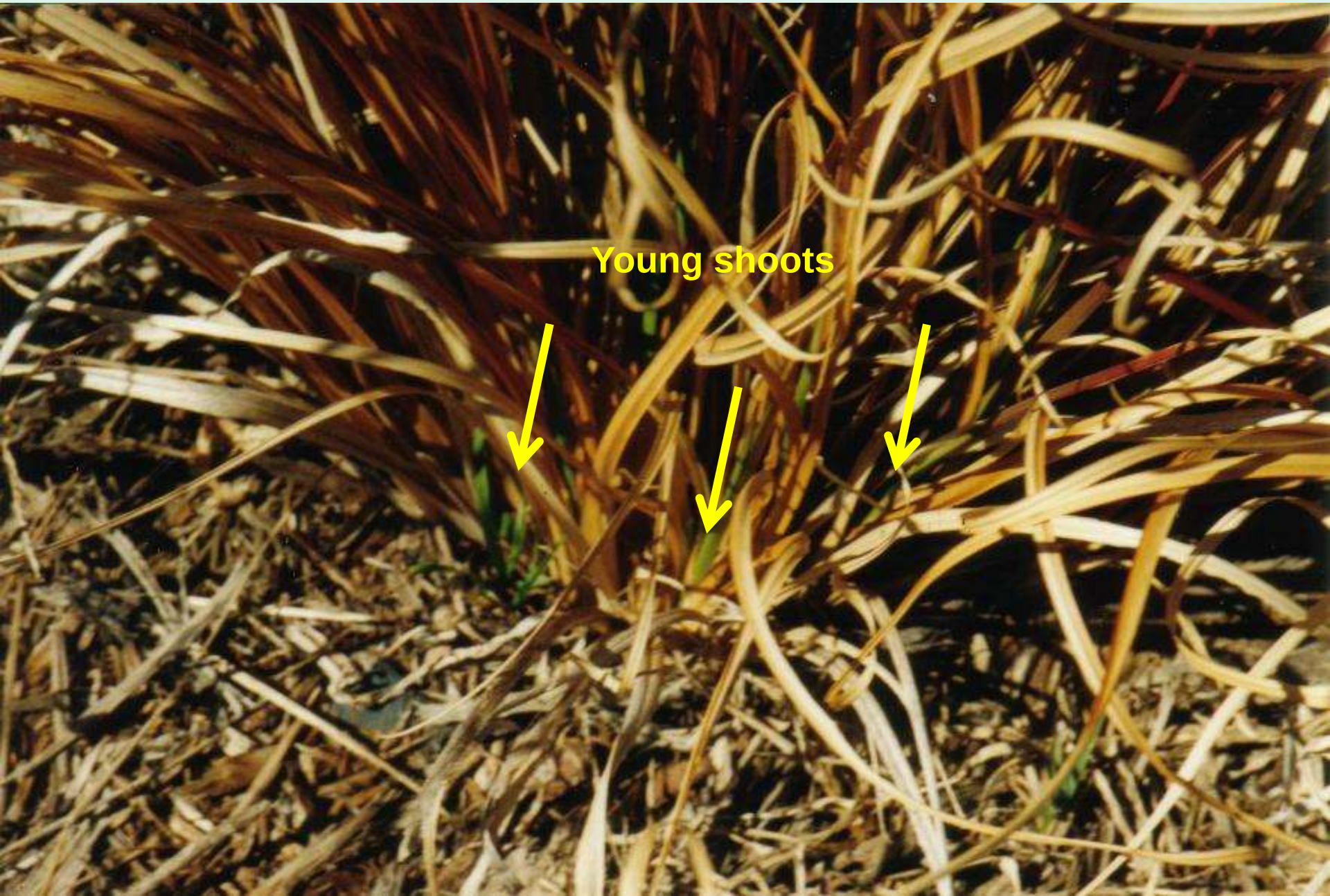
Regrowth after winter in the first year. Better growth could be expected in later years

Severe and frequent frost on Australian Highland

Top growth was killed during one of the most severe winter on record with 64 frosts and ground température at -14ºC

Top growth was completely dried up

Thick canopy insulated and protected young shoots in winter



Vetiver recovered and resumed vigorous growth early in spring

Summer growth at same site

VETIVER SURVIVAL UNDER SNOW

A simple trial was conducted by D. Rachmeler in January, 2015.

1- On the first occasion, vetiver was covered by 35cm of snow for 4 days

2- A second snow period, 5 weeks later, vetiver was covered by 18cm of snow.

On both occasions, night temperatures was -3ºC and 3ºC during the day

Snow cover

First occasion

Second occasion

For control one pot was taken in door during snow periods

Vetiver taken indoor during snow periods

Same Vetiver pot after snow periods

Vetiver appearance after snow periods

Trimming after snow periods showing all the pots looked exactly the same with no difference between the pot taken inside versus those pots left outside.

VETIVER IN CALIFORNIA'S MOJAVE DESERT, A TRIAL FOR APPLICATION IN ECOLOGICAL RESTORATION

Matthew Huffine & David S. Price (Extract ICV6 Presentation)

The main aim of this project was to test the suitability of Vetiver grass as "nurse" plants to either help jump start native revegetation initiatives or to ensure the continued survival of native seedlings in adverse conditions until they are well established. This site has winter lows of -9.5 - -6.5ºC.

It has been reported that Vetiver grass can survive temperatures as low as -12ºC (10ºF) if following daytime temperatures rise well above freezing and the ground is not frozen.

Initial trials have indicated that Vetiver Grass can survive in the High Desert over a winter with recorded lows of at least -6ºC.

Winter Trials

1. At the MRC Nursery in February

At planting with drip irrigation

MRC Nursery site in February with winter lows at least -6ºC and soil at 7.5ºC (45.5ºF)

Results

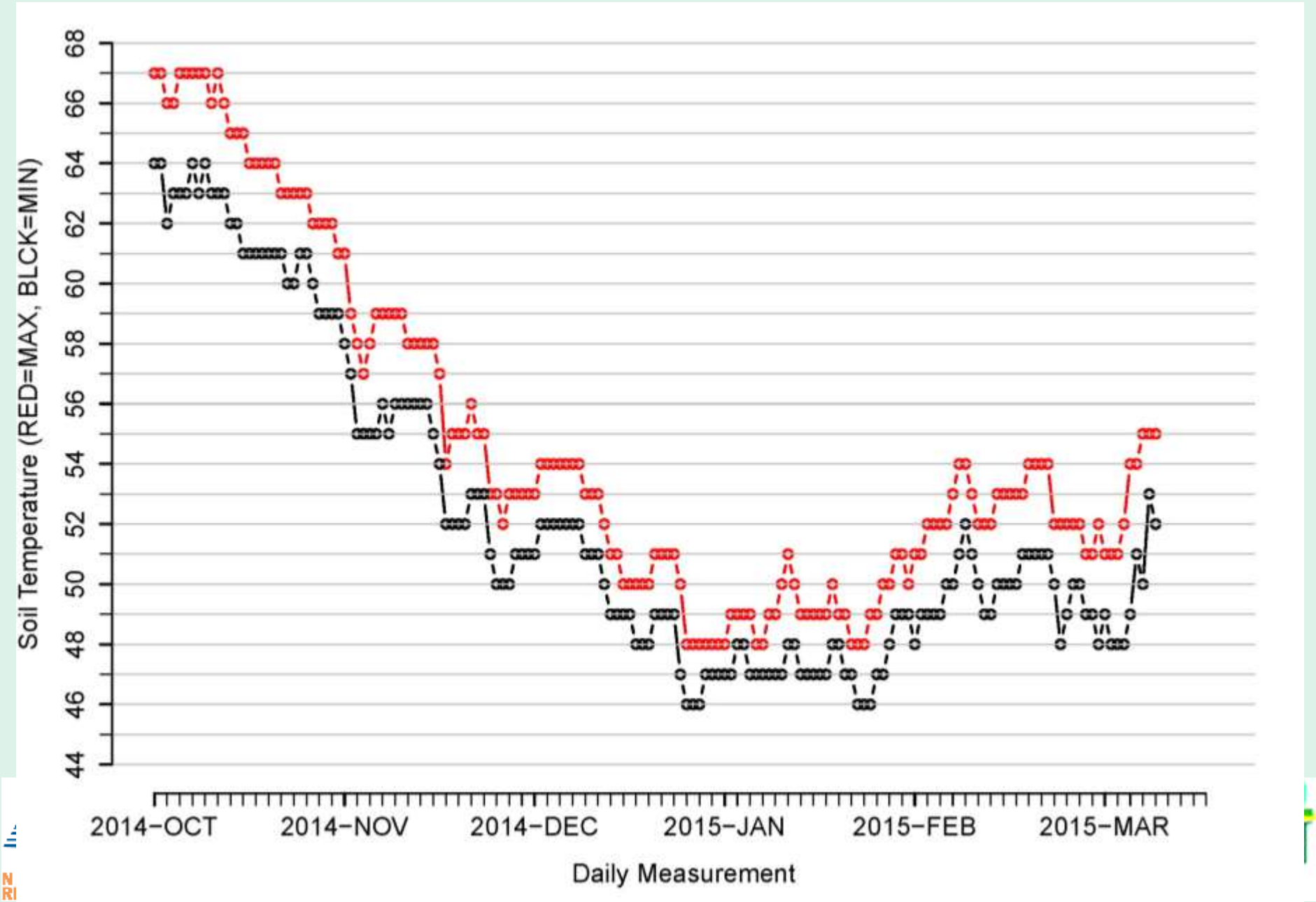
By early February the clumps had increased in diameter from between 35 mm (~1.5 inch) on average to between 75 and 150 mm (3 to 6 inches) and foliage had attained an average height of over 75 cm (30 inches).

After the harshest winter weather was past, with lows of at least -6ºC, grass tops were almost entirely brown though there were still some green shoots just above the unharmed crown.

Soil temperatures are an important factor determining whether Vetiver will survive overwintering or not. The recorded low for soil temperature for the local station is 7.5ºC (45.5ºF), well above freezing.

NATURAL RESOURCES

Soil temperature for the local station is 7.5ºC (45.5ºF)



Winter Trials

2. At Matthew Huffine's garden

A few slips were also planted in Matthew Huffine's garden to determine their survival rate in the expected 43+ºC (110+ºF) summer heat and - 4ºC (25ºF) winter temperature.

This site is about 760 m (2,500 feet) in elevation. The growing season is longer here than at the MRC Nursery with temperature generally not as extreme.

The Vetiver slips at this sight produced foliage that measured around 165cm (5 ½ feet), with each slip producing a clump that averaged 15-20cm (6 to 8 inches) in diameter from their 35mm diameter beginnings.

Matthew Huffine's garden

NATURAL RESOURCES

Vetiver Growth In Winter Under Field Conditions

Under field conditions, when air temperature gradually drop with the onset of winter, Vetiver growth was also affected

One obvious and peculiar sign is its leaves gradually turn purplish red in colour, a typical reaction of Vetiver under stress. This can be low temperature, water stress, high salinity, extreme pH and other toxic materials

Purple colour on leaves is a typical symptom of P deficiency in most crop and orchard plants, but not necessary with Vetiver

In thick sward, growth was not severely affected by low temperature, it remained active, as it was protected by outer layers

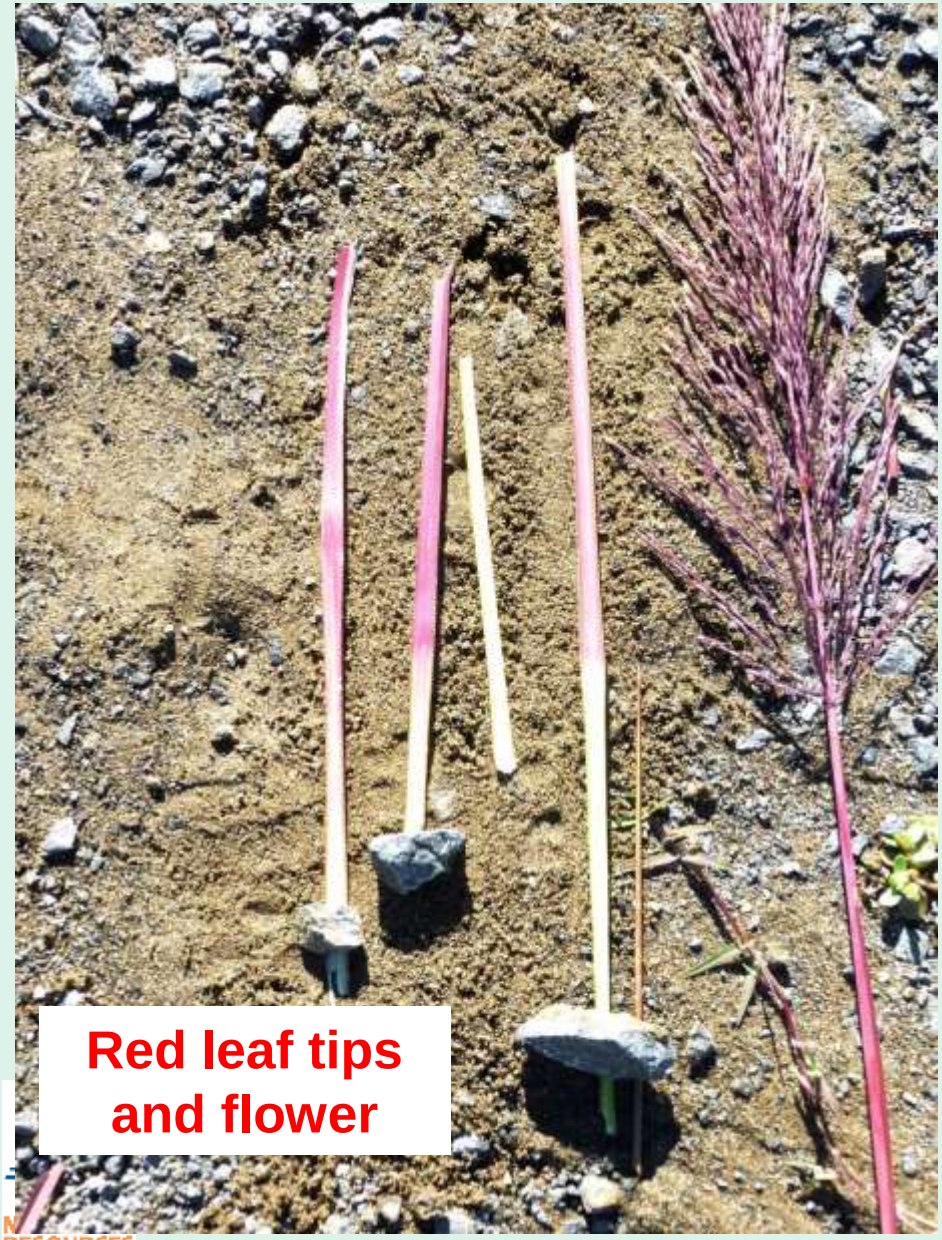
NATURAL RESOURCES

Leaf tips of new growth turn purple in low temperature

Frosted old vetiver with purple-red leaves in winter in Australia

Frost only affected plant tops and the outside plants of thick sward, the inside plants were still green and active

Frosted vetiver leaves with purple-red colour



Research on Cold Tolerance of Vetiver

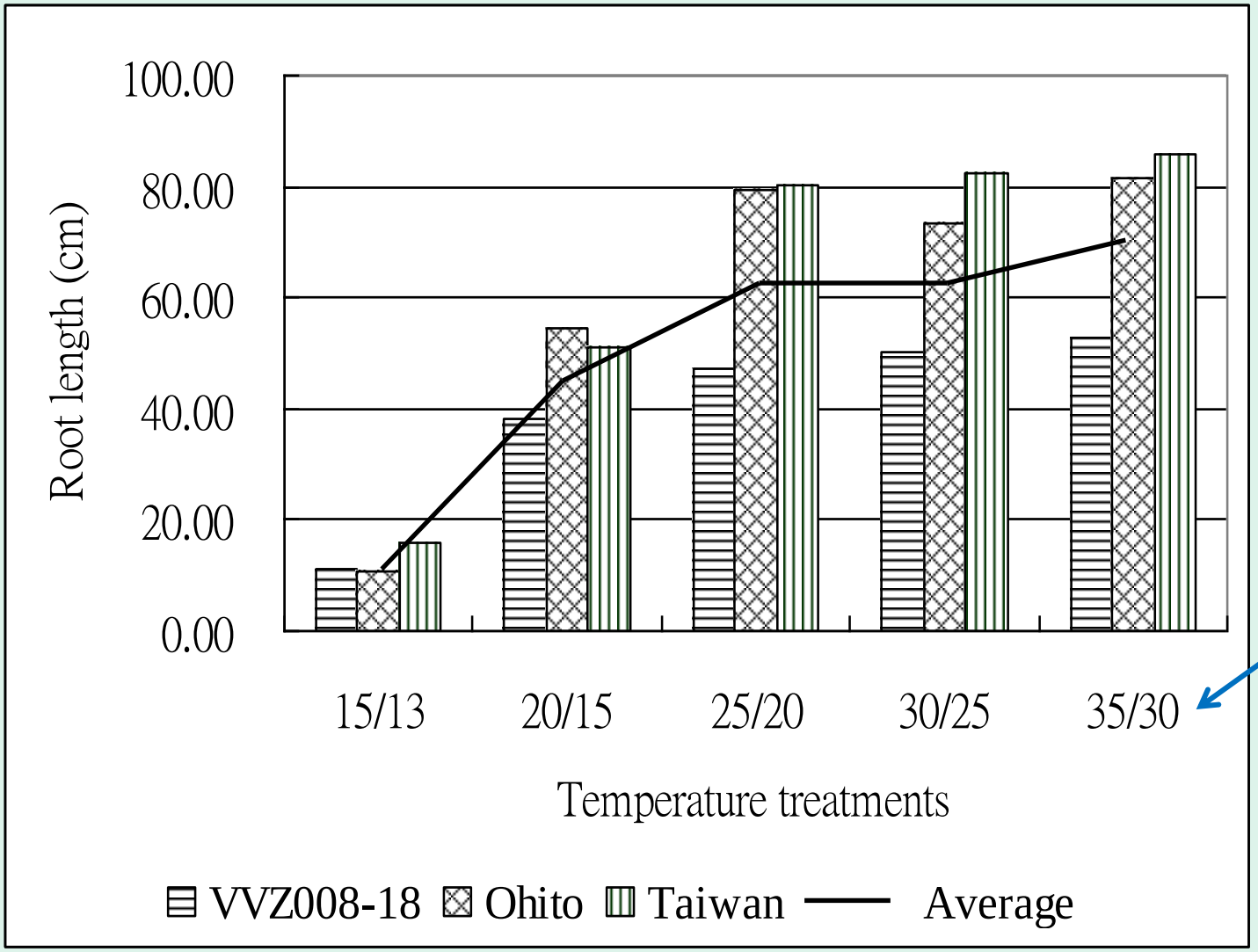
The growth characteristics of vetiver were studied in the phytotron by Dr. Yue-Wen Wang of National Taiwan University.

On average, at temperature above the 25°C, daily root growth of 3 cm was recorded.

Although very little shoot growth occurred at the soil temperature range of 15°C (day) and at 13°C (night), root growth continued at the rate of 12.6cm/day, indicating that Vetiver grass was not dormant at this temperature

Extrapolation suggested that root dormancy occurred at about 5°C (Fig.1).

Fig.1: Effect of soil temperature on the growth of Vetiver root



Temperature treatments: **day/night**

***Genotypes*: VVZ008-18, Ohito, and Taiwan, the latter 2 are basically the same as Sunshine.**

Small portable plastic house can be used to cover the planting in winter,

SUMMARY

1. *Survival*

Air temperature of -6ºC and soil at 7.5ºC (45.5ºF)

2. *Shoot Growth (Biomass)*

Growth stops at air temperature between 5ºC and 10ºC and leaves turn purple-red in colour

3. *Root Growth*

Root continue to grow to about 5ºC (dormancy)

4. *Death*

When the soil is frozen at the crown level (top 5cm)

CONCLUSION

These slides show Vetiver can survive very cold winter, it dies when the crown is frozen in the ground. In very cold, frosted or under snow cover the outside plants of the thick sward protect the interior part, which remains green and actively treating effluent. Under extremely cold and dry conditions, its shoots turn brown but new growth resumes from underground buds.

Normally disposal rate under these conditions is reduced by half.

To overcome this a small portable plastic house can be used in winter to cover the planting

THANK YOU