

**Easter lilies –
*Pratylenchus
penetrans***



**125F - 10
MINUTES**



**HOT WATER TREATMENT FOR
FRUIT AND
NUT TREE ROOTSTOCKS**

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**IAB
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**125F - 20
MINUTES**



CALIFORNIA:

EXTERNAL - QUARANTINES

BURROWING NEMATODE (RADOPHOLUS SIMILIS)

56 INTERCEPTIONS 1988-1994

RENIFORM NEMATODE (ROTYLENCHULUS

RENIFORMIS) 40 INTERCEPTIONS 1988-1994

STING NEMATODE (BELONOLAIMUS

LONGICAUDATUS) (COACHELLA VALLEY)

INTERNAL - NURSERY NEMATODE CONTROL

PROGRAM FOR FRUIT AND NUT TREES,

GRAPEVINE, BERRY AND VEGETABLE

PLANT NURSERY STOCK

CERTIFICATION PROGRAMS FOR GARLIC AND

STRAWBERRY

COST OF PRODUCING FRUIT AND NUT TREE ROOTSTOCKS:

FUMIGATION \$3,886/ACRE*

SITE INSPECTION \$500

TOTAL \$4,386/ACRE

**36 INCH ROW SPACING, 6 INCH PLANT SPACING =
29,040 TREES/ACRE**

ASSUME HALF (14,520) REACH HARVESTABLE SIZE

THE ADDITIONAL COST = 0.30/TREE

**COMMERCIAL ORCHARD PLANTS 100-150
TREES/ACRE**

THE ADDITIONAL COST = \$30 TO \$45/ACRE

***35.5 GPA Telone II with TIF Film**

(Effective January 1, 1992)
SUGGESTED PROCEDURE
FOR SUPERVISION OF
HOT WATER TREATMENT OF GRAPEVINES
FOR NEMATODE CONTROL

125 F $\pm$ 1 F (51.7 C) for 5 minutes

This treatment is a means of salvaging infested rootings. It is not a substitute for a nematode-free nursery soil or for fumigation. Use of this procedure must be approved by the commissioner in advance.

Following is a suggested procedure to be used for supervision of hot water treatment for nematode control.

I Conditions under which hot water treatment of grapevines may be approved.

- 1 To clean up dormant grapevine nursery stock found infested with nematodes.
- 2 If an approved fumigation is blocked by conditions beyond the nurseryman's control after the fumigant has been applied.
- 3 If a dispensation is granted by the Director.

HOT WATER TREATMENT:

Vol. 43, No. 3--PLANT DISEASE REPORTER--Mar. 15, 1959

ERADICATION OF ROOT-KNOT NEMATODES FROM GRAPEVINE ROOTINGS BY HOT WATER

Bert Lear¹ and L. A. Lider²

Summary

Exposure of grape rootings infected with root-knot nematodes to hot-water treatments resulted in eradication of Meloidogyne incognita acrita and M. javanica javanica in the following treatments: 118° F -- 30 minutes; 120° -- 10 minutes; 125° -- 5 minutes; and 127° -- 3 minutes. No injury was observed from these treatments on 16 commercial varieties and 4 experimental selections of grape rootings.

GRAPE ROOTSTOCK HOT WATER TREATMENT:



STRAWBERRY PLANT HOT WATER TREATMENT:



Temperature

Nematode	C	F	Minutes	Crop	Reference
<i>Meloidogyne spp.</i>	45	113.0	30	Tomatoes	Yun et al., 2021
<i>Heterodera spp.</i>	47	116.6	20	Wheat	Ibrahim et al., 2019
<i>Ditylenchus dipsaci</i>	48	117.4	30	Onions	Greco et al., 2019
<i>Globodera spp.</i>	50	122.0	20	Potatoes	Perry et al., 2018
<i>M. incognita</i>	52	125.6	15	Potatoes	McSorley et al., 2020
<i>Pratylenchus spp.</i>	55	131.0	10	Bananas	Hallmann and Meressa, 2018
<i>Rotylenchulus reniformis</i>	57	134.6	5	Pineapple	Bridge and Starr, 2007
<i>M. javanica</i>	58	136.4	10	Cucumbers	Thies et al., 2019
<i>H. dihystra</i>	60	140.0	5	Sugarcane	Stirling, 2014
<i>H. columbus</i>	62	143.6	5	Soybeans	Schmitt and Inserra, 2013
<i>Xiphinema index</i>	65	150.8	5	Grapevine	Tzortzakakis et al., 2016

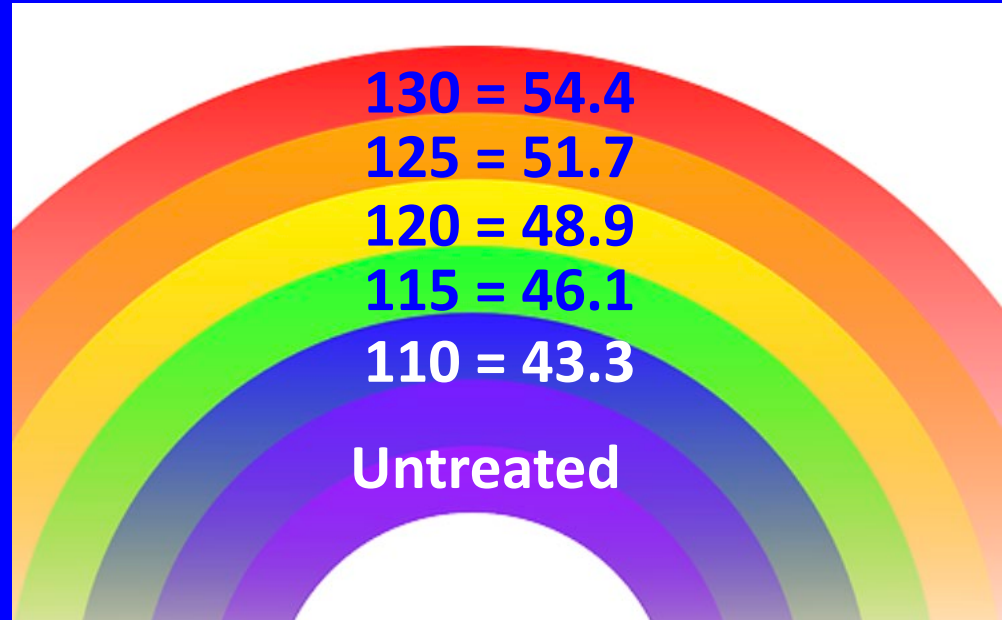
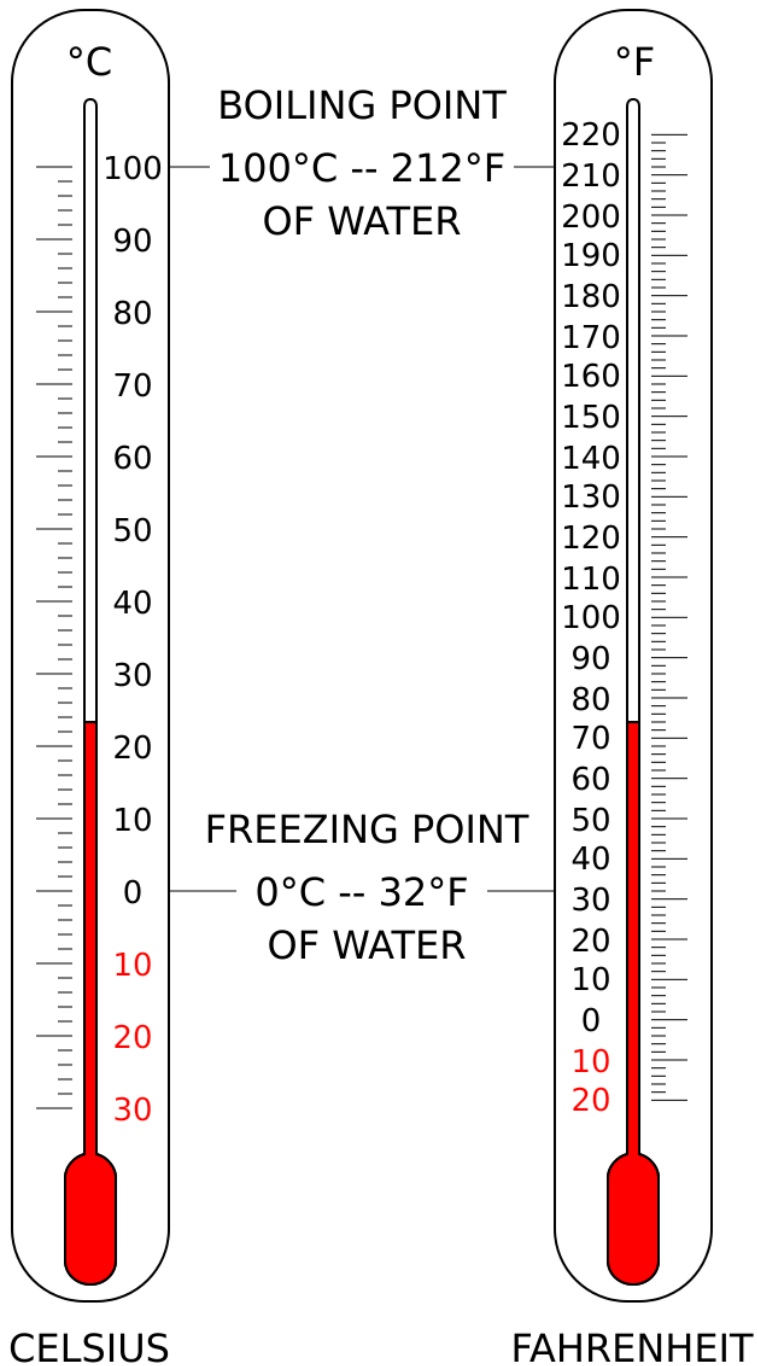
HOT WATER TREATMENT:

**TEMPERATURE & TIME NEEDED DEPEND ON
NEMATODE SPECIES
CROP VARIETY OR CULTIVAR**

**ACCURATE TIME AND TEMPERATURE CONTROLS
ARE NEEDED**

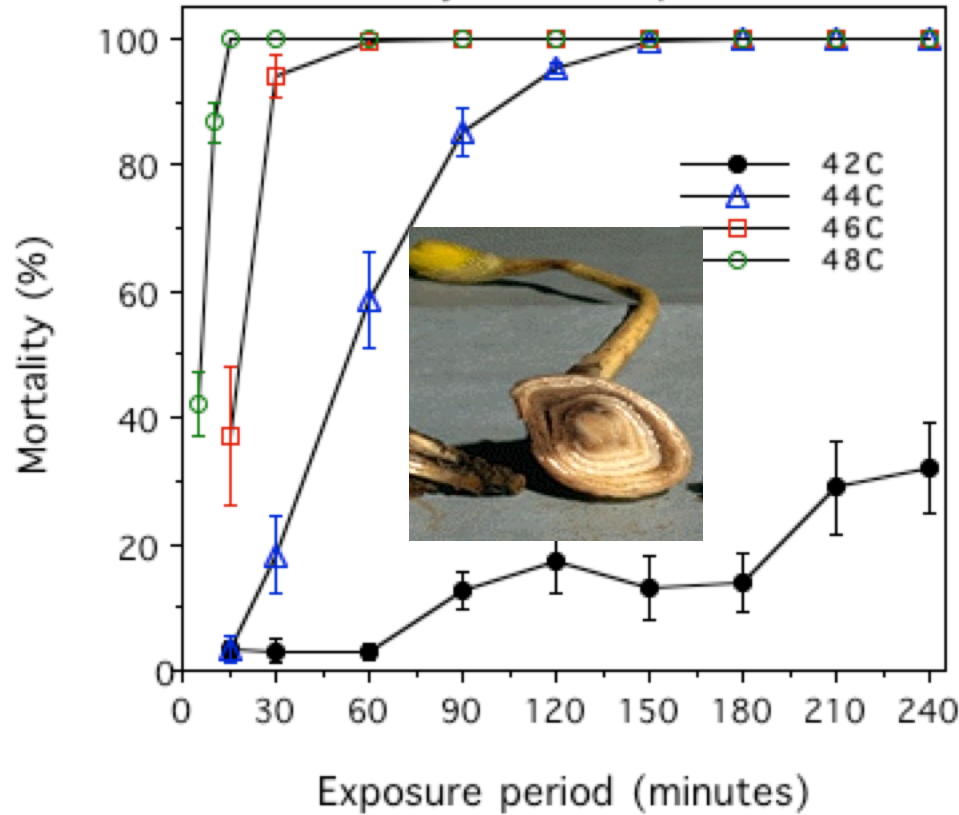
**TOO HIGH OF A TEMPERATURE OR TOO LONG OF
AN EXPOSURE PERIOD CAN DAMAGE PLANT
MATERIAL**

**TOO SHORT A TIME PERIOD OR TOO LOW A
TEMPERATURE MAY NOT KILL NEMATODES
MAY AGGRAVATE FUNGAL PROBLEMS**



COMPARISON OF TIME AND TEMPERATURE NEEDED TO KILL STEM AND BULB NEMATODE AND FOLIAR NEMATODE

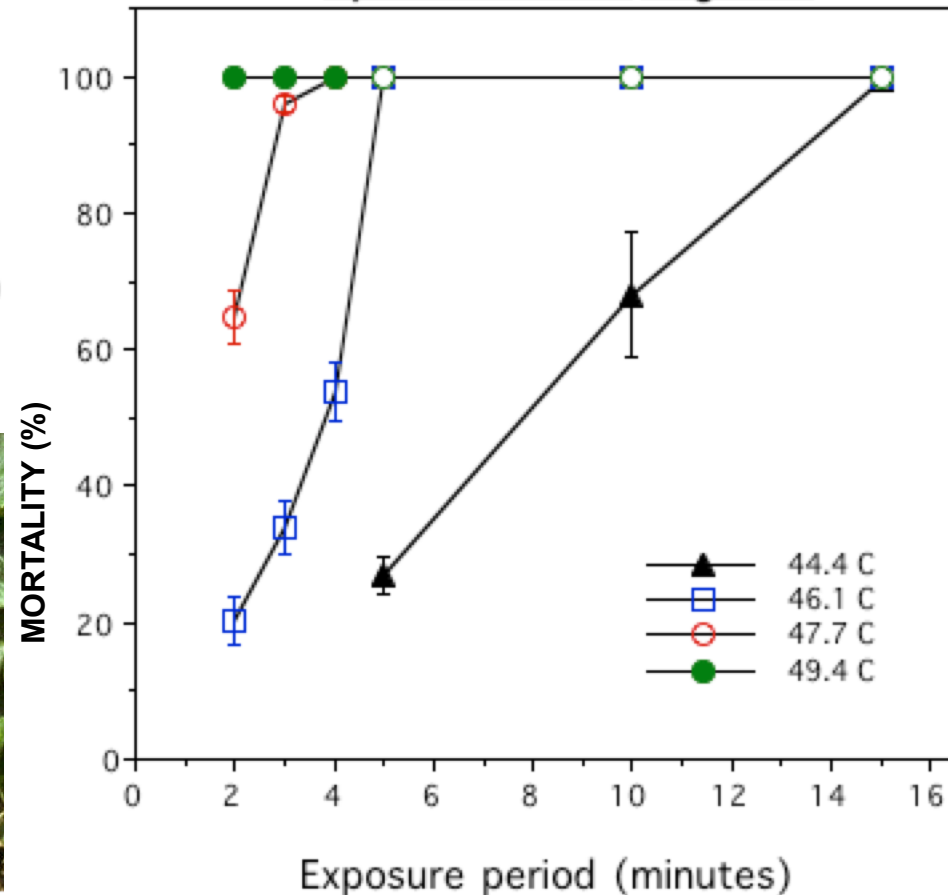
Ditylenchus dipsaci



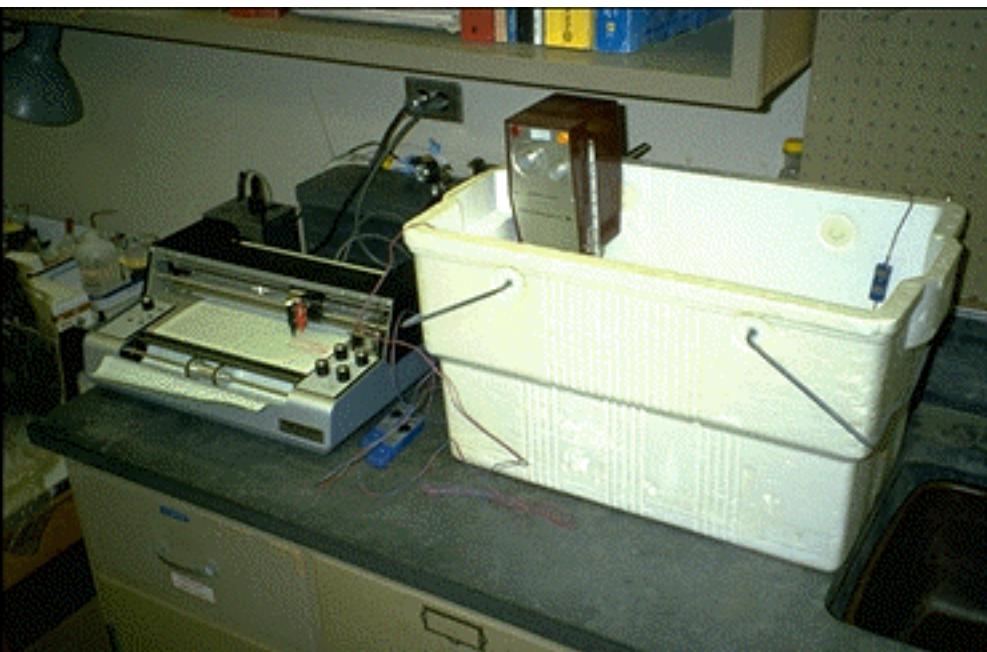
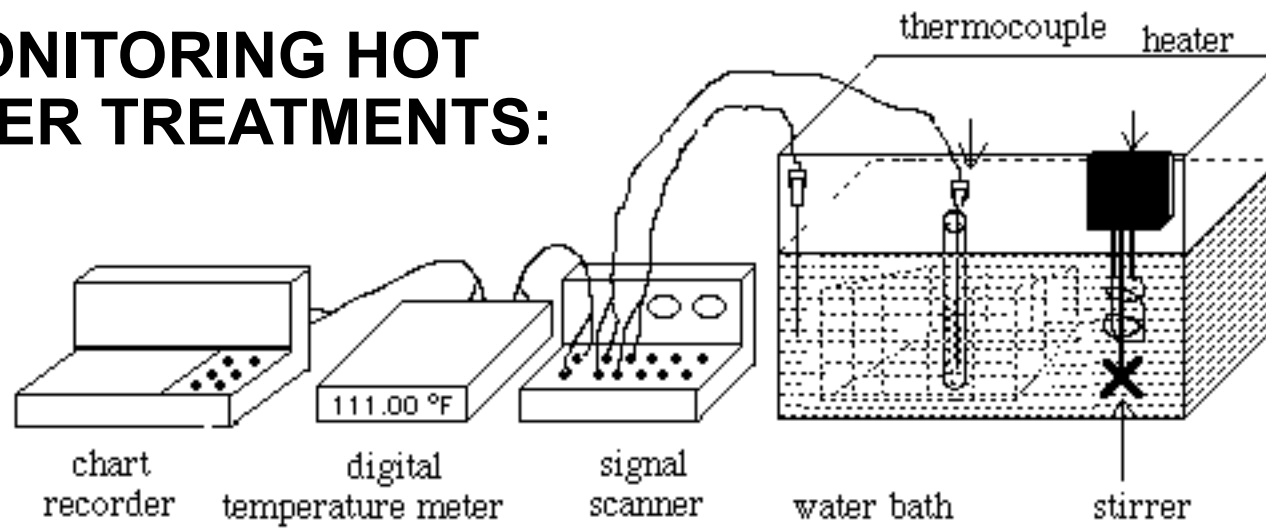
42C = 107.6F
 44C = 111.2F
 44.4C = 112F
 46C = 114.8F
 46.1C = 115F
 47.7C = 118F
 48C = 118.4F
 49.4C = 121F



Aphelenchoides fragariae

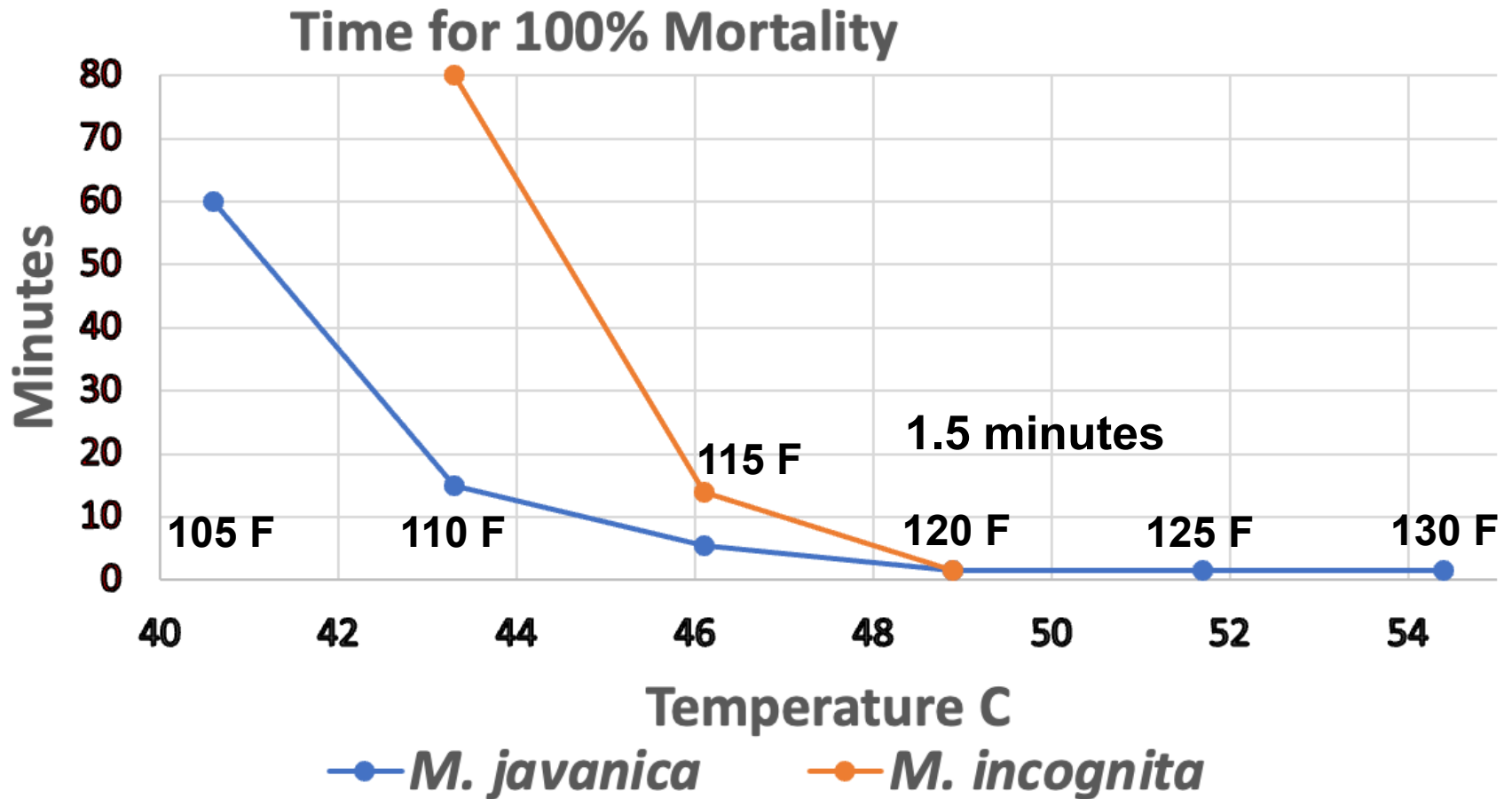


MONITORING HOT WATER TREATMENTS:



Meloidogyne incognita
Meloidogyne javanica
Pratylenchus vulnus

**Nematodes in water
in test tubes
3 replicates
Trial repeated 3 times**



***P. vulnus* – 1 minute or less at all temperatures tested.**

HOT WATER TREATMENTS OF ROOTSTOCKS

PEACH: LOVELL AND NEMAGUARD

PRUNE: MYROBALAN AND MARIANNA

WALNUT: PARADOX AND ENGLISH

5 TEMPERATURES

110, 115, 120, 125, 130 F

5 LENGTHS OF TREATMENT PLUS UNTREATED

5 REPLICATES

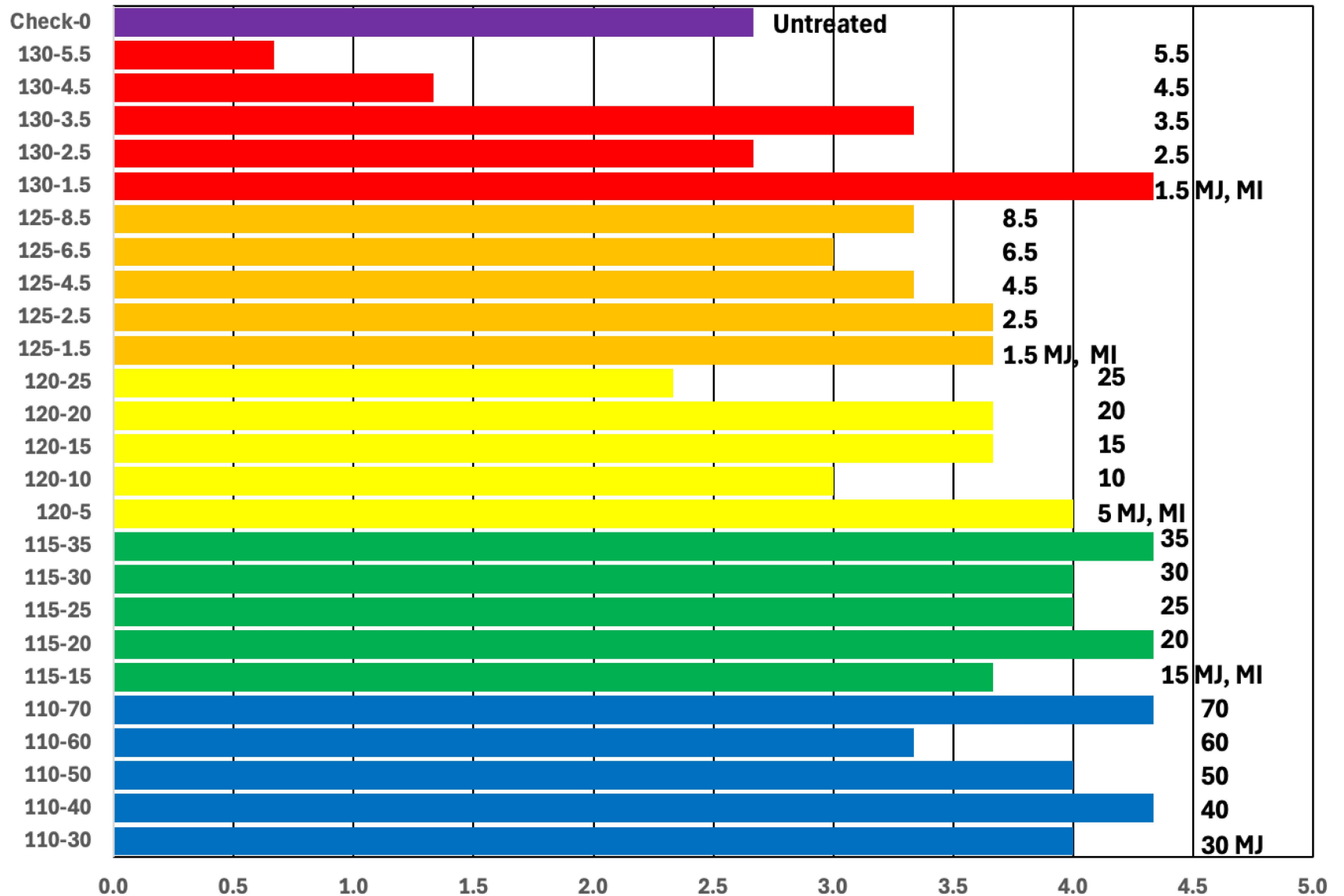
EACH YEAR FOR 3 YEARS

PLANTED IN FIELD FOR 2 YEARS

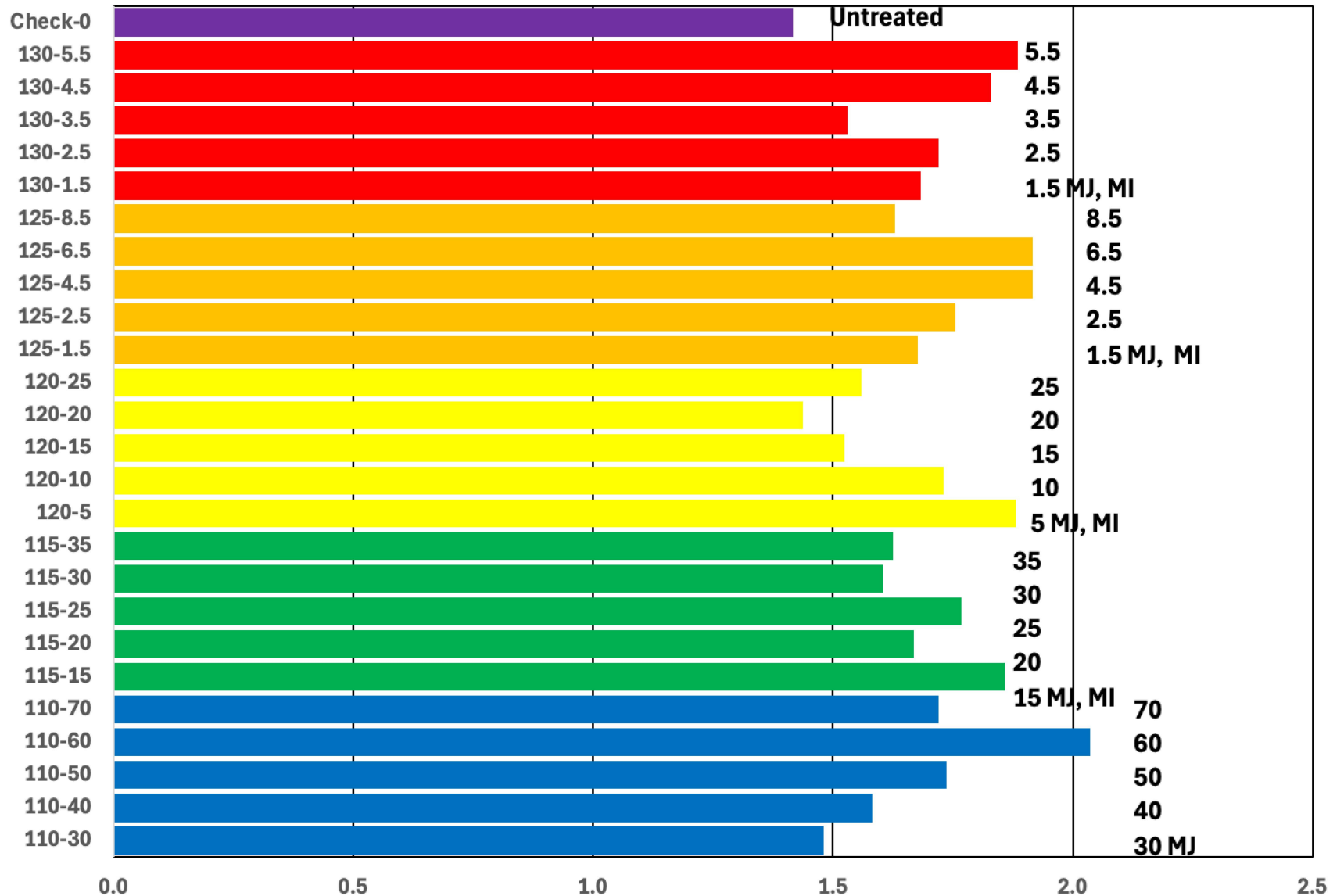
**EVALUATED SURVIVAL, VIGOR, TRUNK
CIRCUMFERENCE**



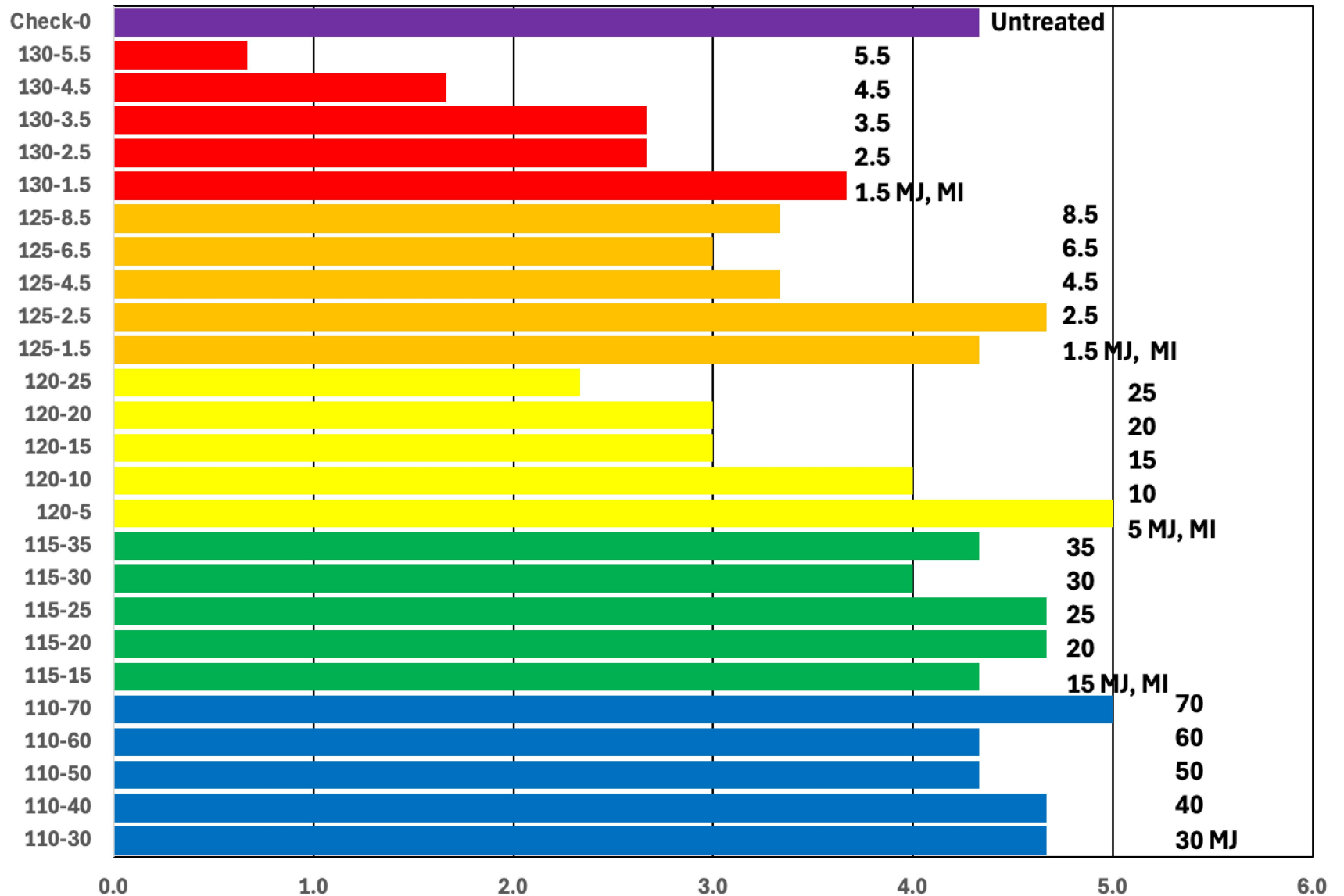
Lovell - 2 Year Survival - Average of 3 Years - 5 Trees / Year



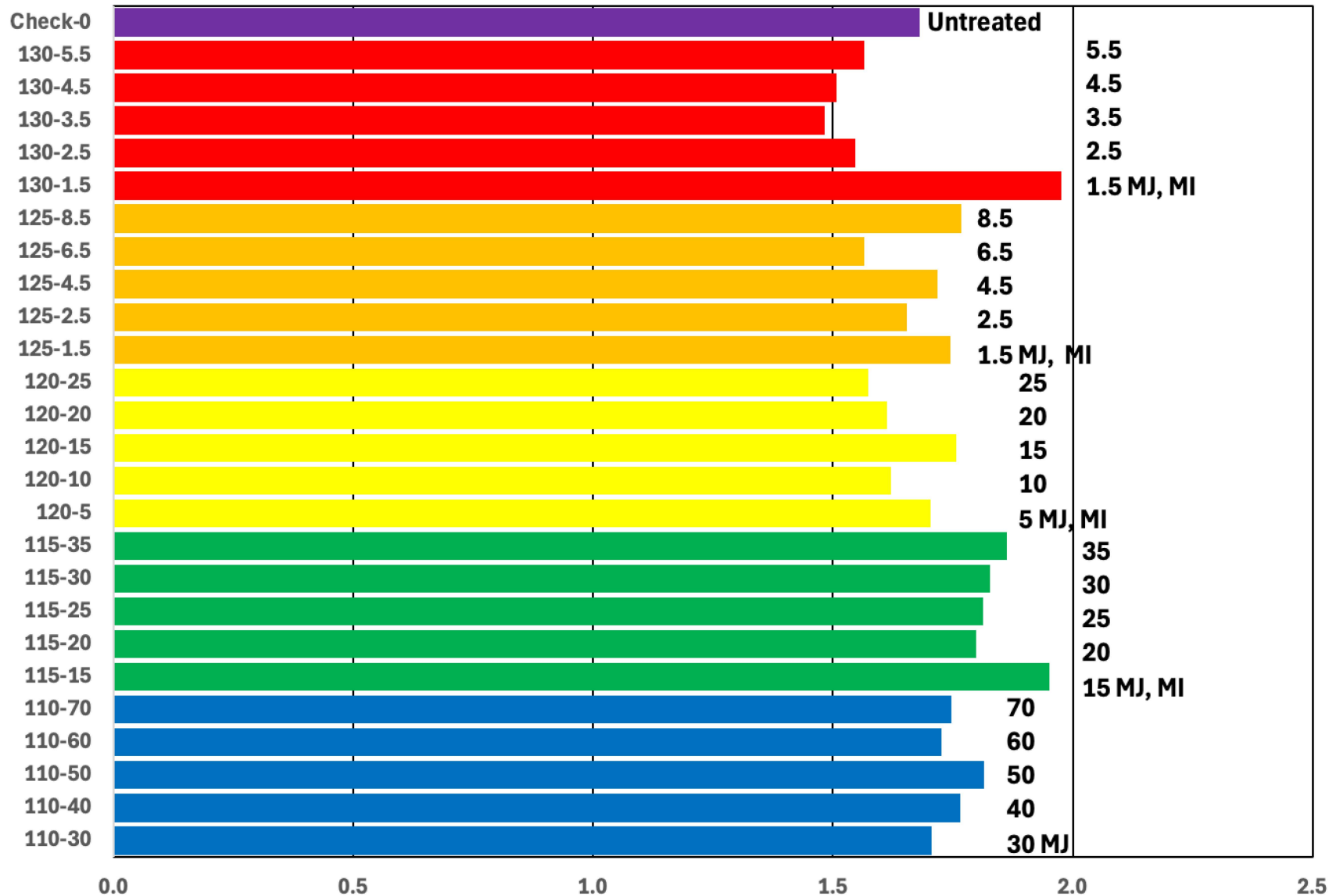
Lovell - Trunk Circumference (cm) after 2 Years - Average of 3 Years - 5 Trees / Year



Nemaguard - 2 Year Survival - Average of 3 Years - 5 Trees / Year



Nemaguard - Trunk Circumference (cm) after 2 Years - Average of 3 Years - 5 Trees / Year



**THE
END**

