Seedling Quality
What Does
The *"Average"* Seedling Look Like?

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Seedling Quality

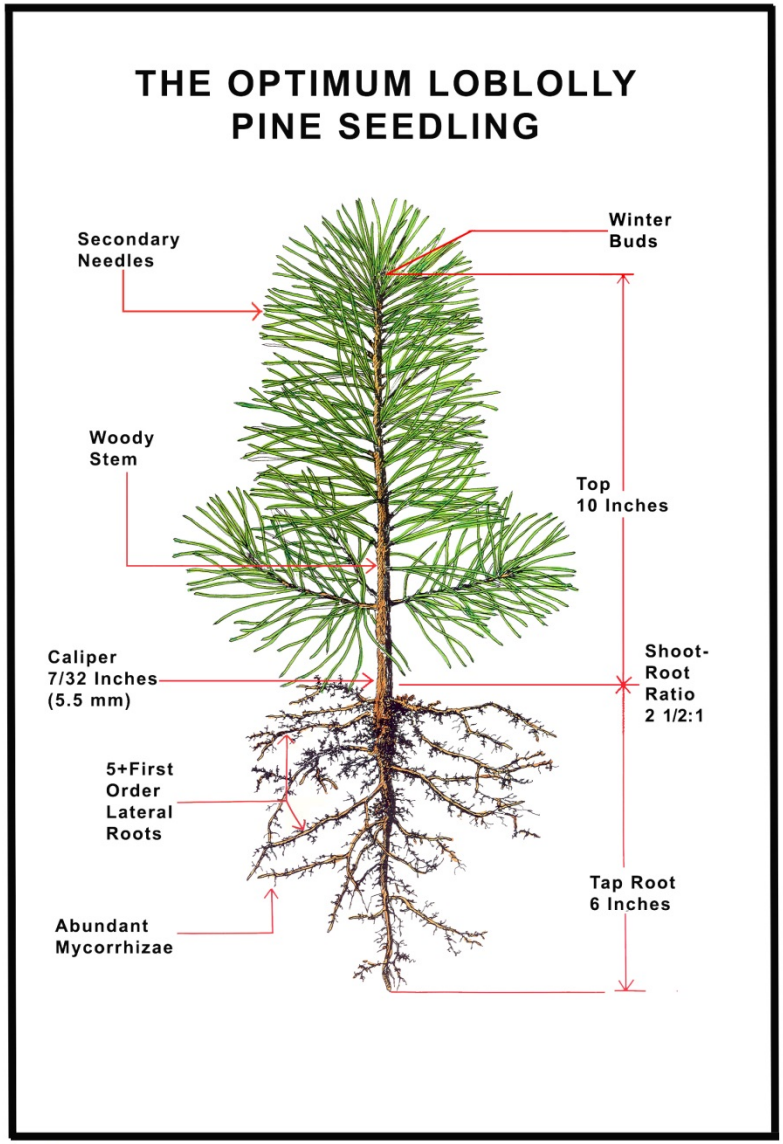
A high quality seedling is one that can survive prolonged environmental stress and produce vigorous growth following out planting.

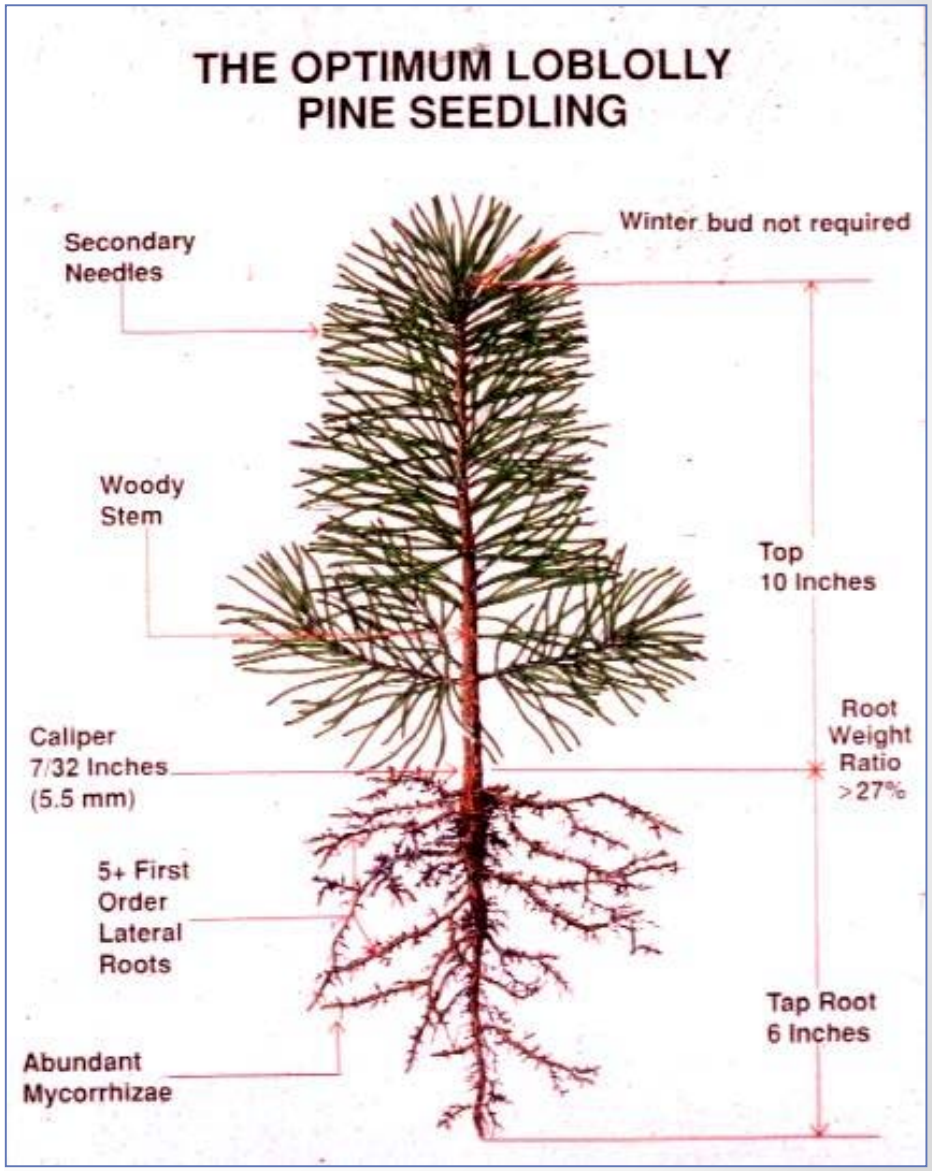
Johnson & Cline . 1984. Seedling Quality of Southern Pines. **In** Duryea. Mary L., and Thomas D. Landis (eds.).. Forest Nursery Manual: Production of Bareroot Seedlings

Seedling Quality

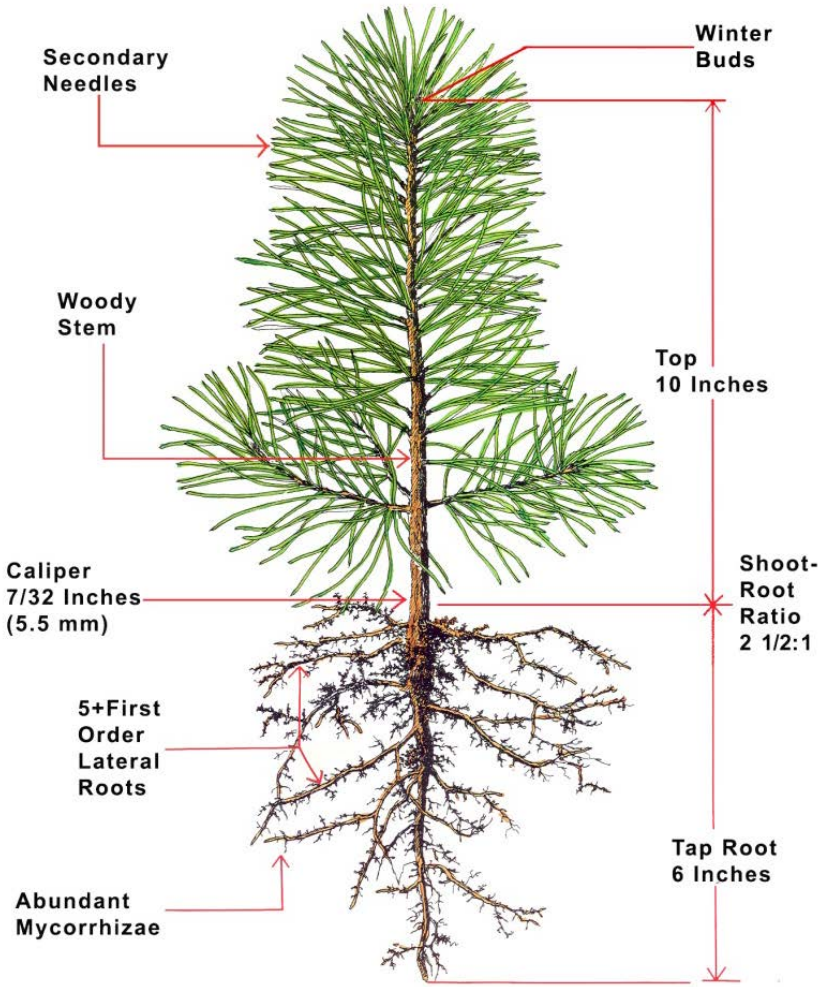
- This presentation is based upon:
  - From 2012-2014 seasons
  - Bareroot - ~300 evaluations (300 reports/30 seedlings/report)
  - Container - ~ 50 evaluations (50 reports/30 seedlings/report)
  - 8 Bareroot nurseries & 4 Container nurseries
  - (BR) - 188 Coastal samples & 36 Piedmont
  - (BR) - 107 Advanced Genetics & 94 1st, 2nd or 3rd gen

Is it Target, Ideal or Optimum Seedling?





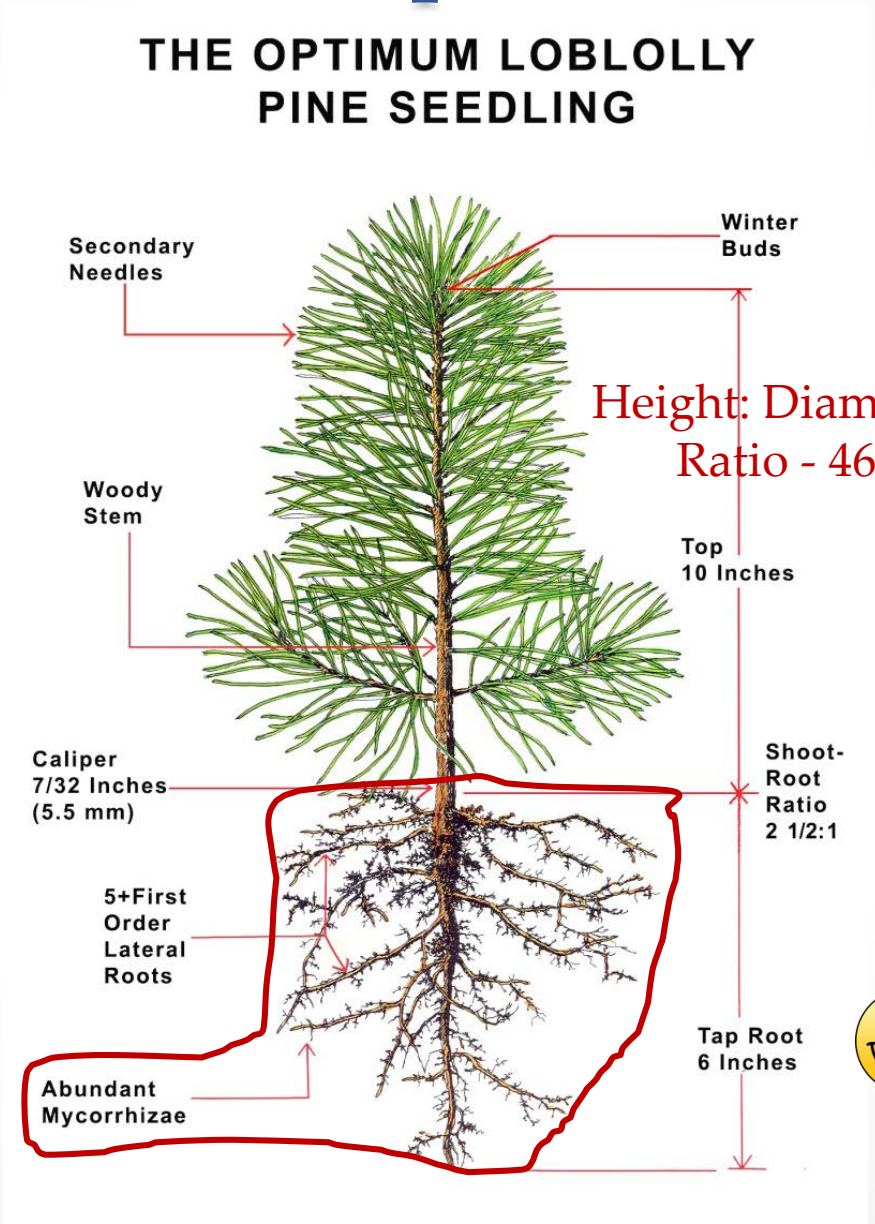
THE OPTIMUM LOBLOLLY PINE SEEDLING



I don't think so! Or at least I hope not!

A quote……."***Quality*** ***produced bare-root loblolly pine seedling just after lifted from nursery bed."***

Target, Ideal or Optimum Seedling



Height: Diameter Ratio - 46

53

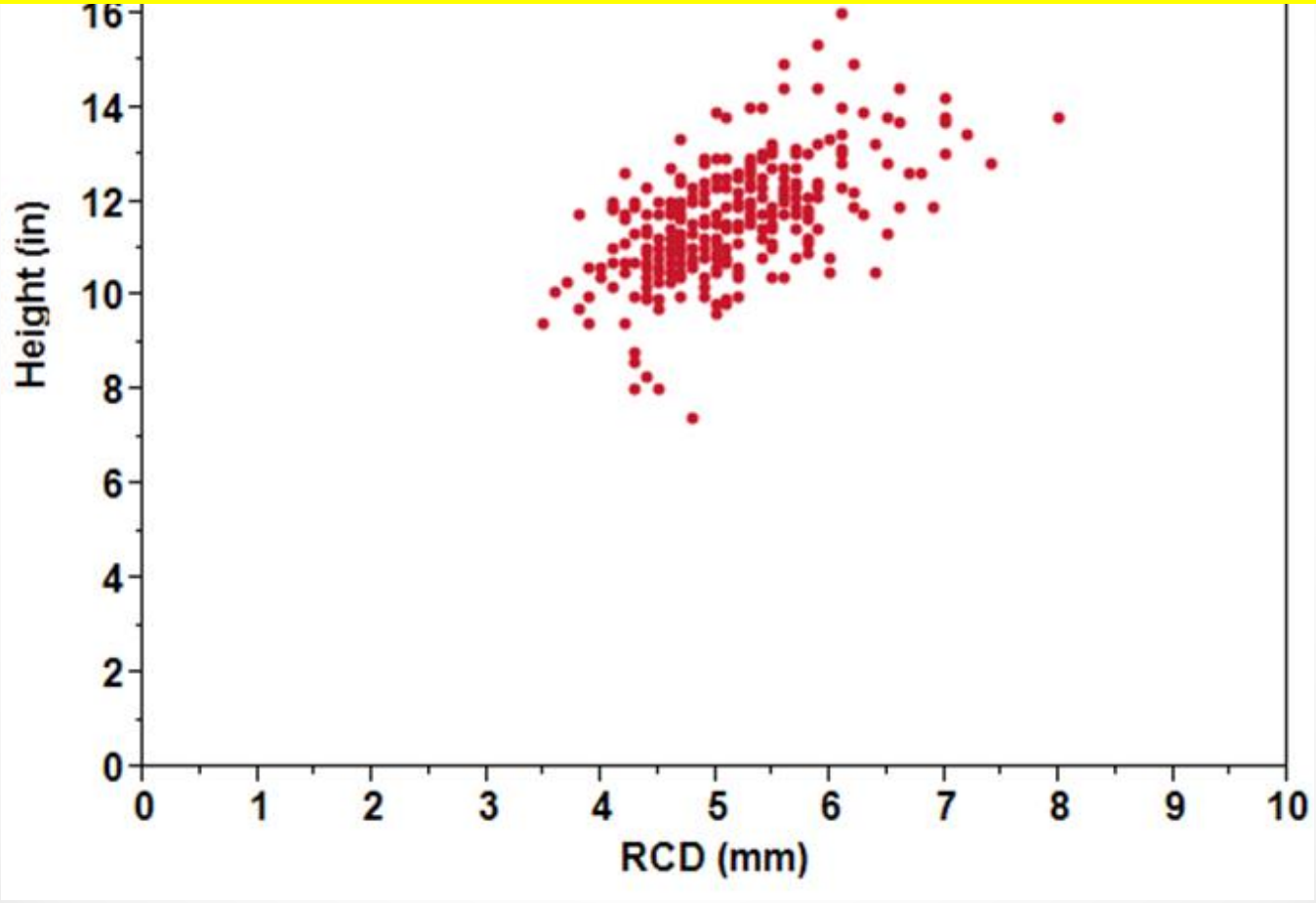
11.6″

5.1 mm

19%

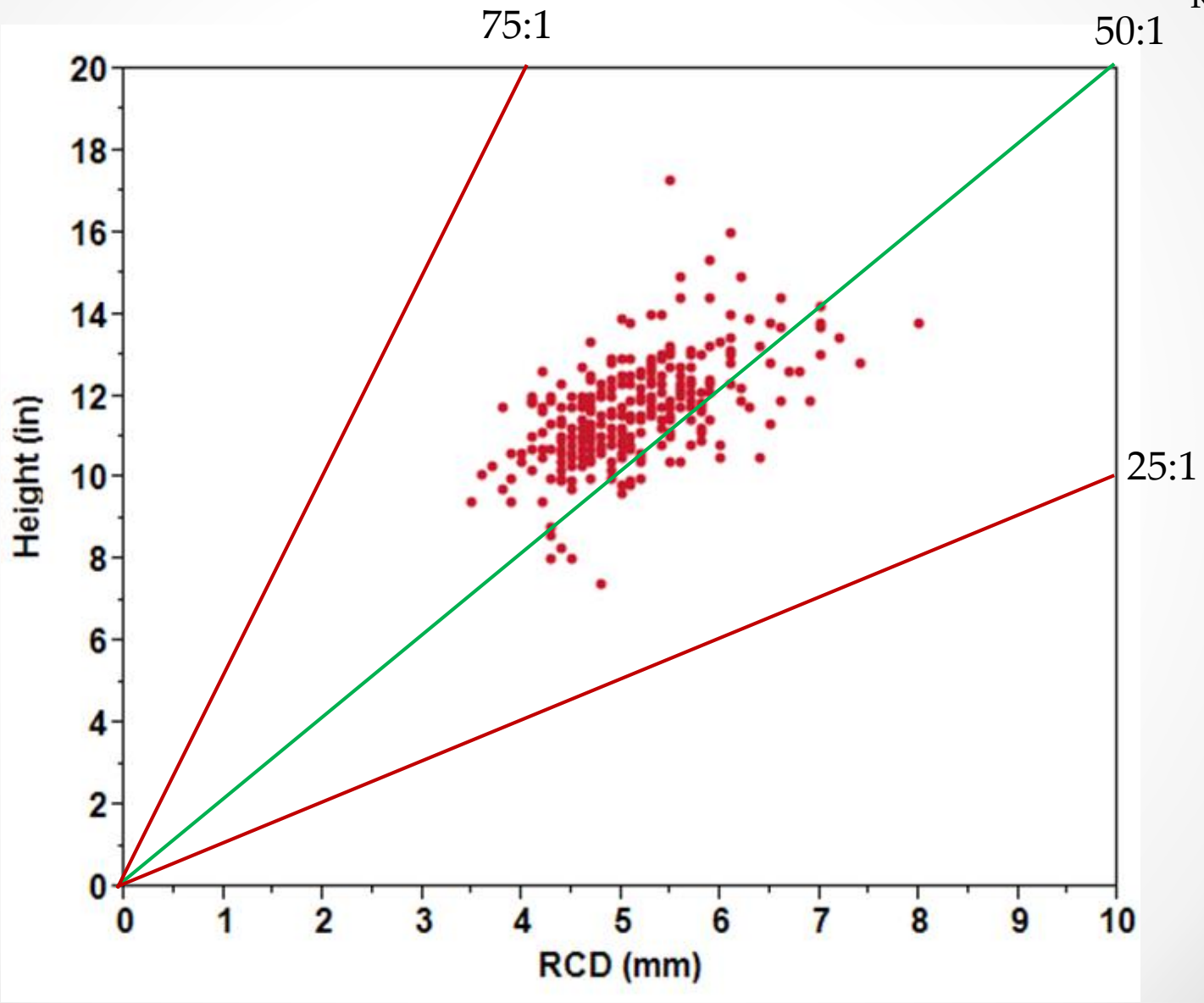
Height: Diameter Ratio - Bareroot

Height:diameter is a sturdiness ratio. A high ratio indicates a relatively spindly seedling while a lower ratio indicates a stouter seedling It is calculated by dividing the seedling height by the stem diameter with height and diameter in the same units

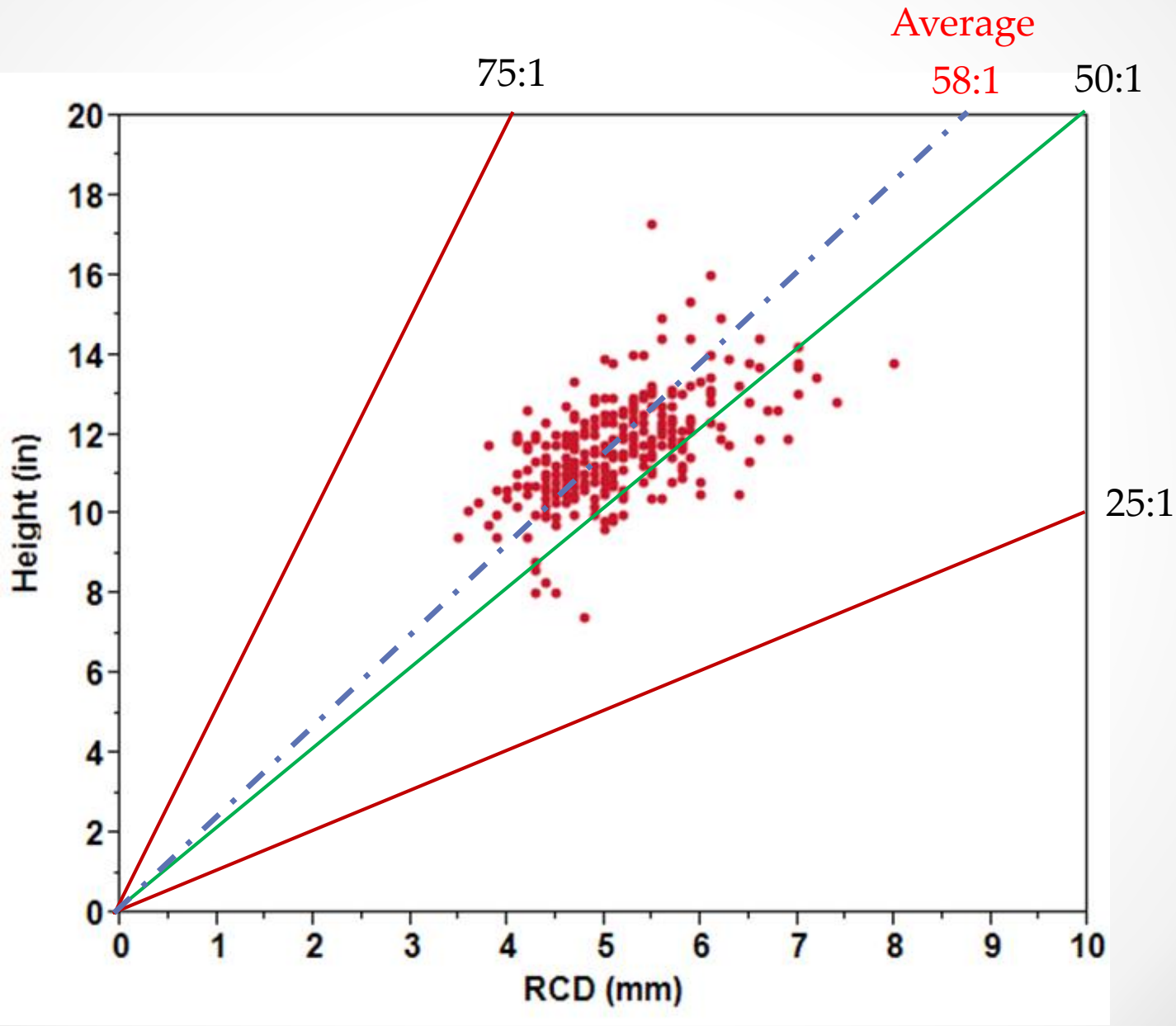


Height: Diameter Ratio - Bareroot

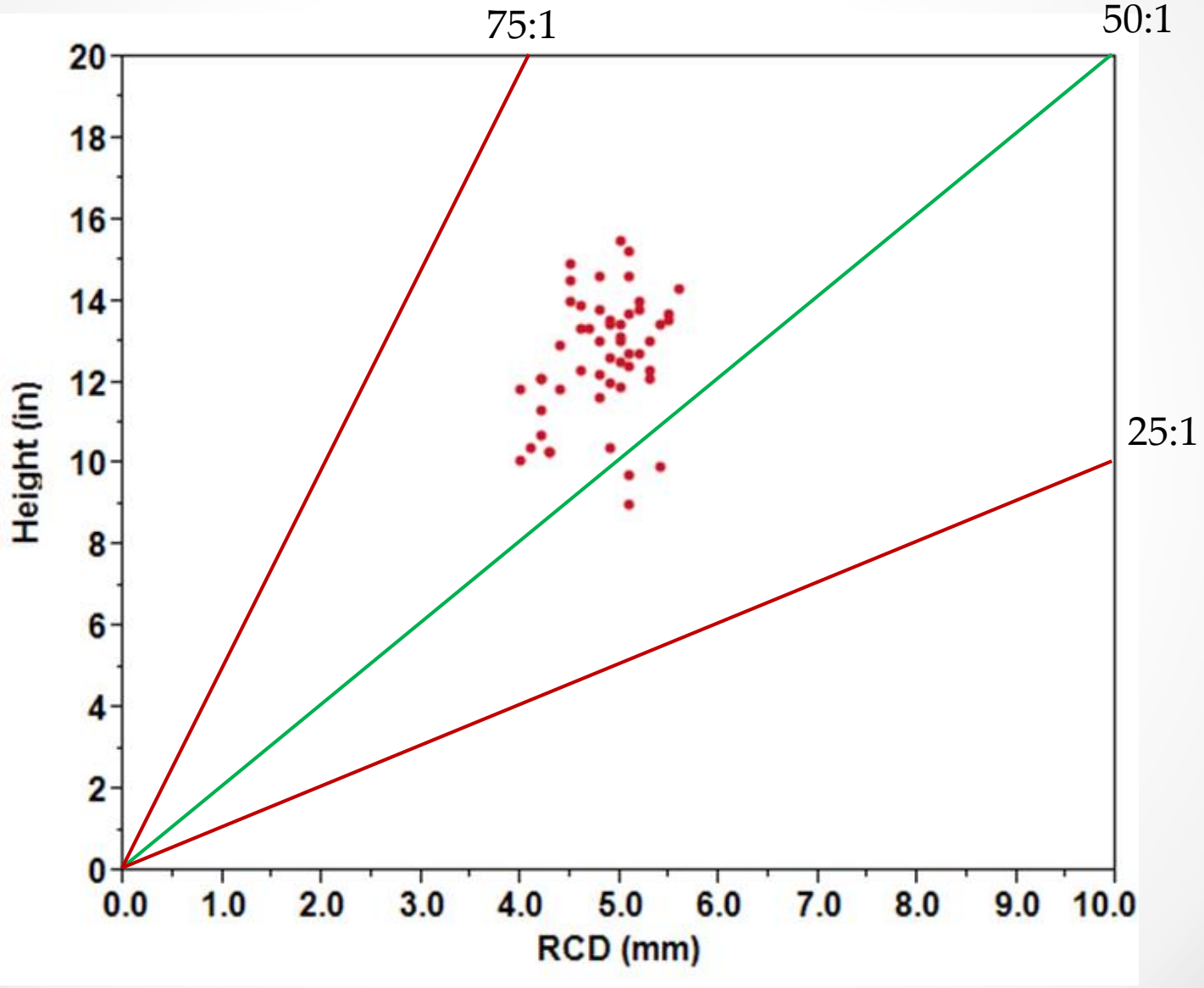
Ht = 10″
RCD = 5



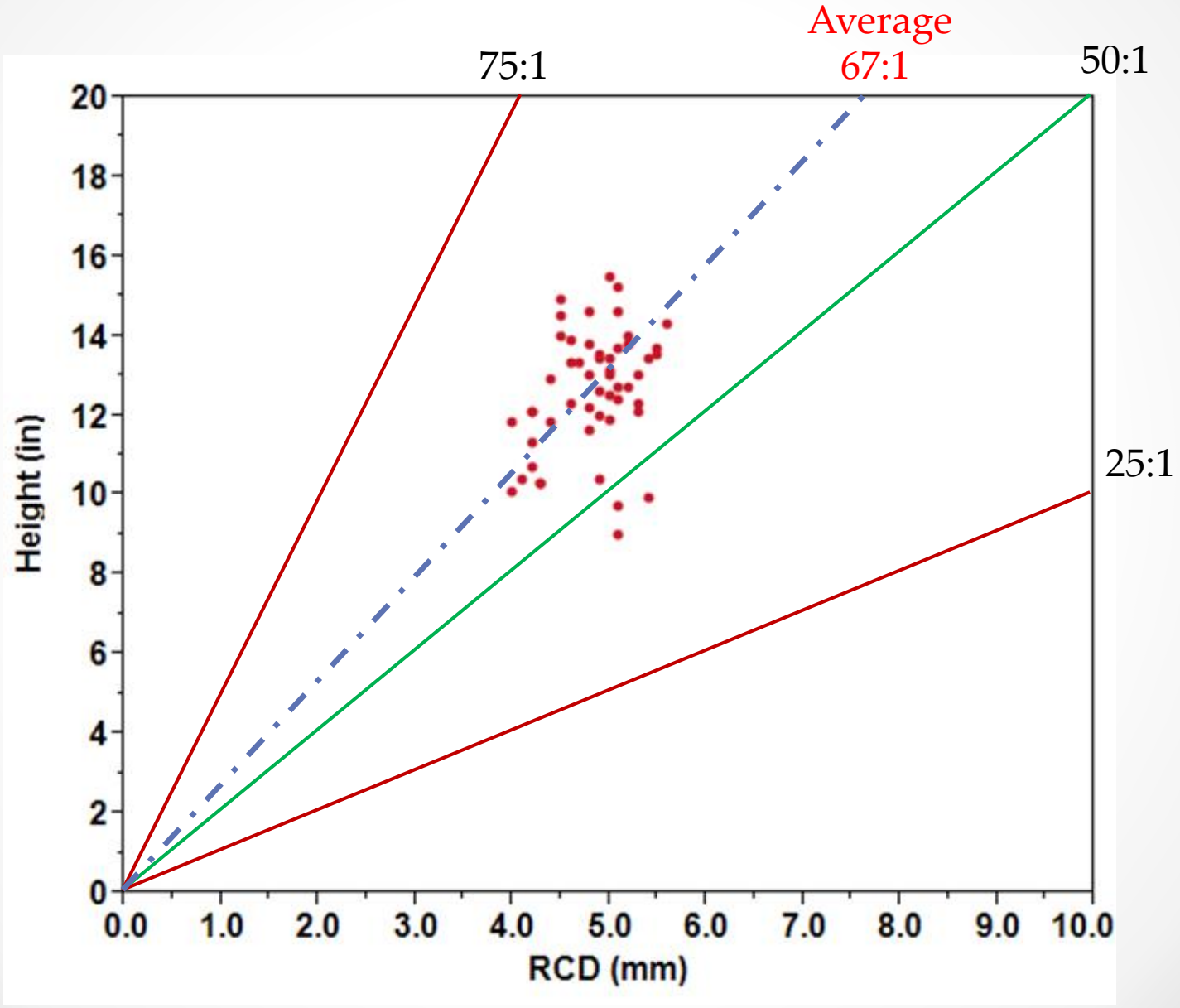
Height: Diameter Ratio - Bareroot

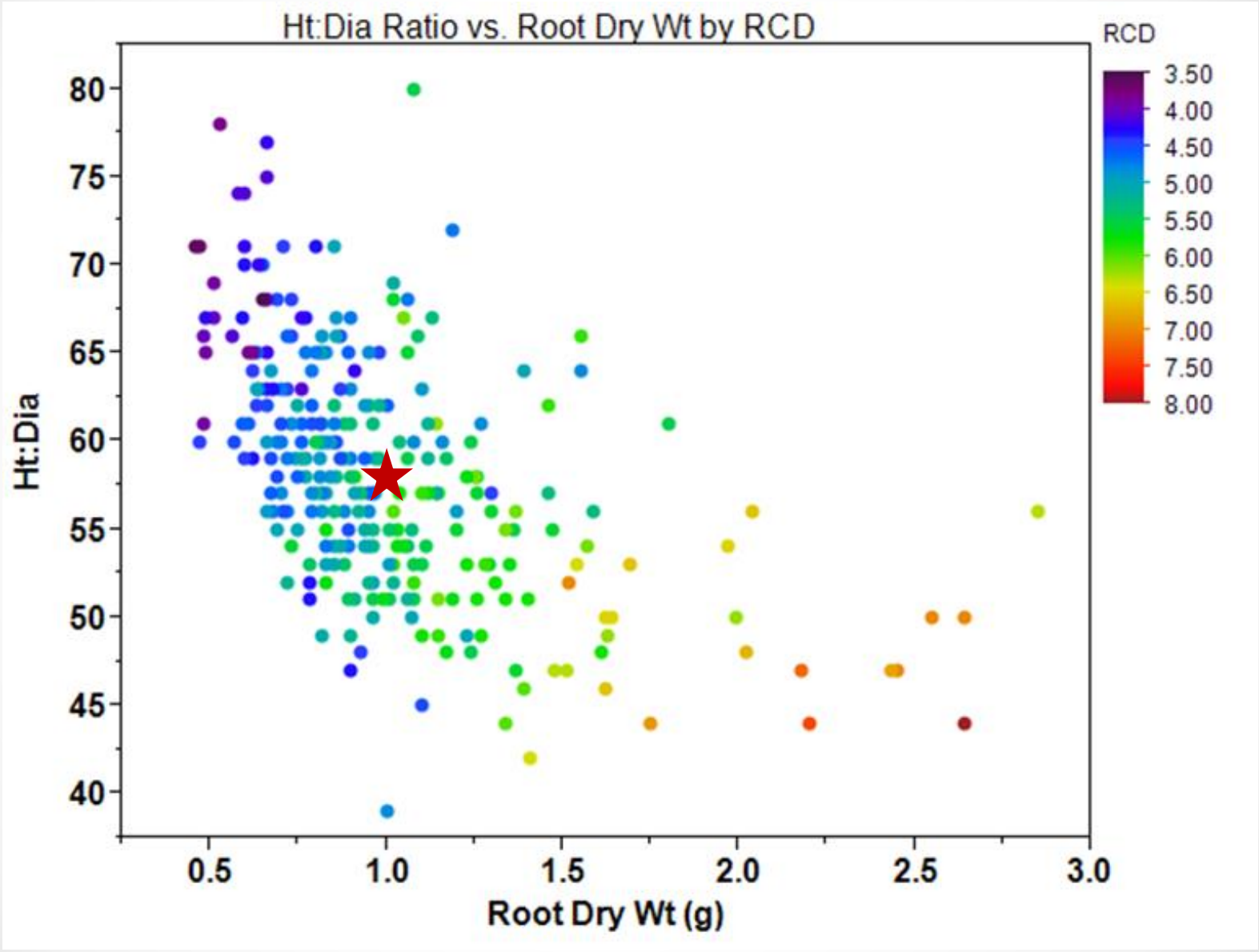


Height: Diameter Ratio - Container



Height: Diameter Ratio - Container




Ht:Dia Ratio vs. Root Dry Wt by RCD
RCD
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
Ht:Dia
80
75
70
65
60
55
50
45
40
0.5
1.0
1.5
2.0
2.5
3.0
Root Dry Wt (g)

Ratios

Shoot:Root Ratio

- Volume of Shoot: Volume of Roots

or

- Weight of Shoot: Weight of Roots

not

- Shoot length : Root Length

- Shoot:Root ratio was never intended to be expressed by dividing taproot length by shoot length.

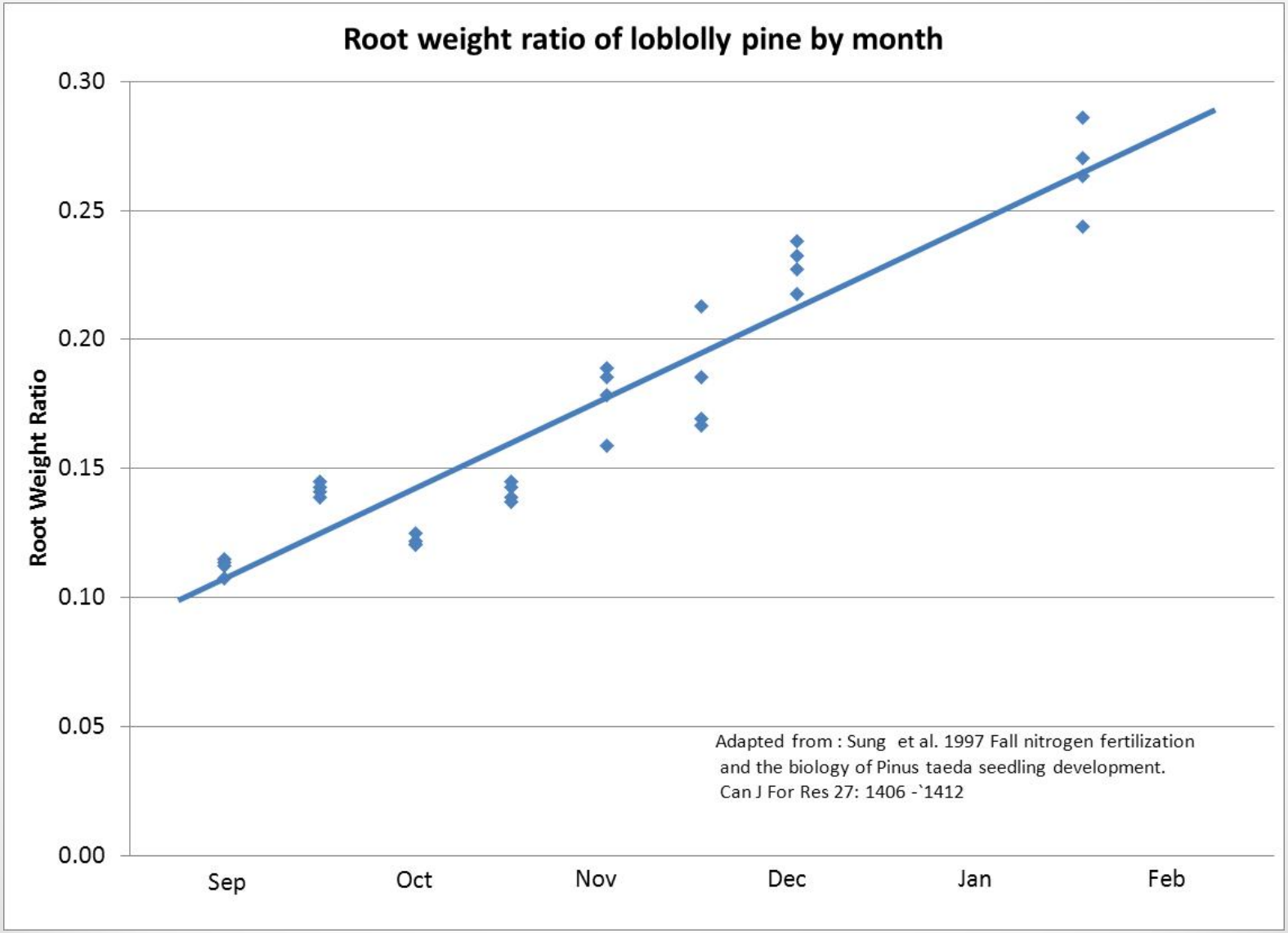
Ratios

Root Weight Ratio

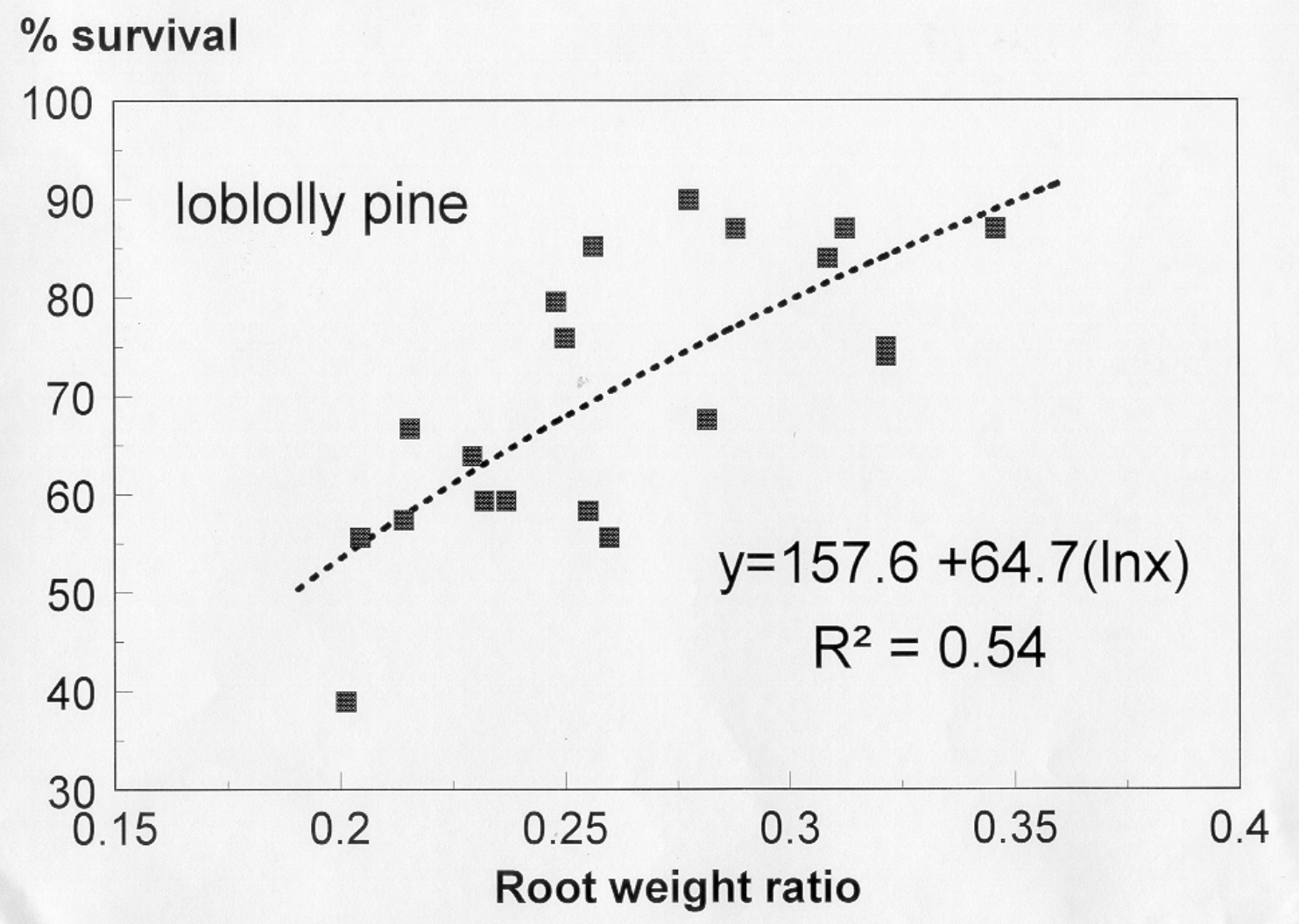
- $$\frac{\boldsymbol{Dry\ Root\ Weight}}{(\boldsymbol{Dry\ Root\ Weight + Dry\ Top\ Weight})} \times \mathbf{100} = \_\_\%$$

- Example: Root wt = 1 gm and Shoot (top) wt = 3 gm
- RWR = ?????

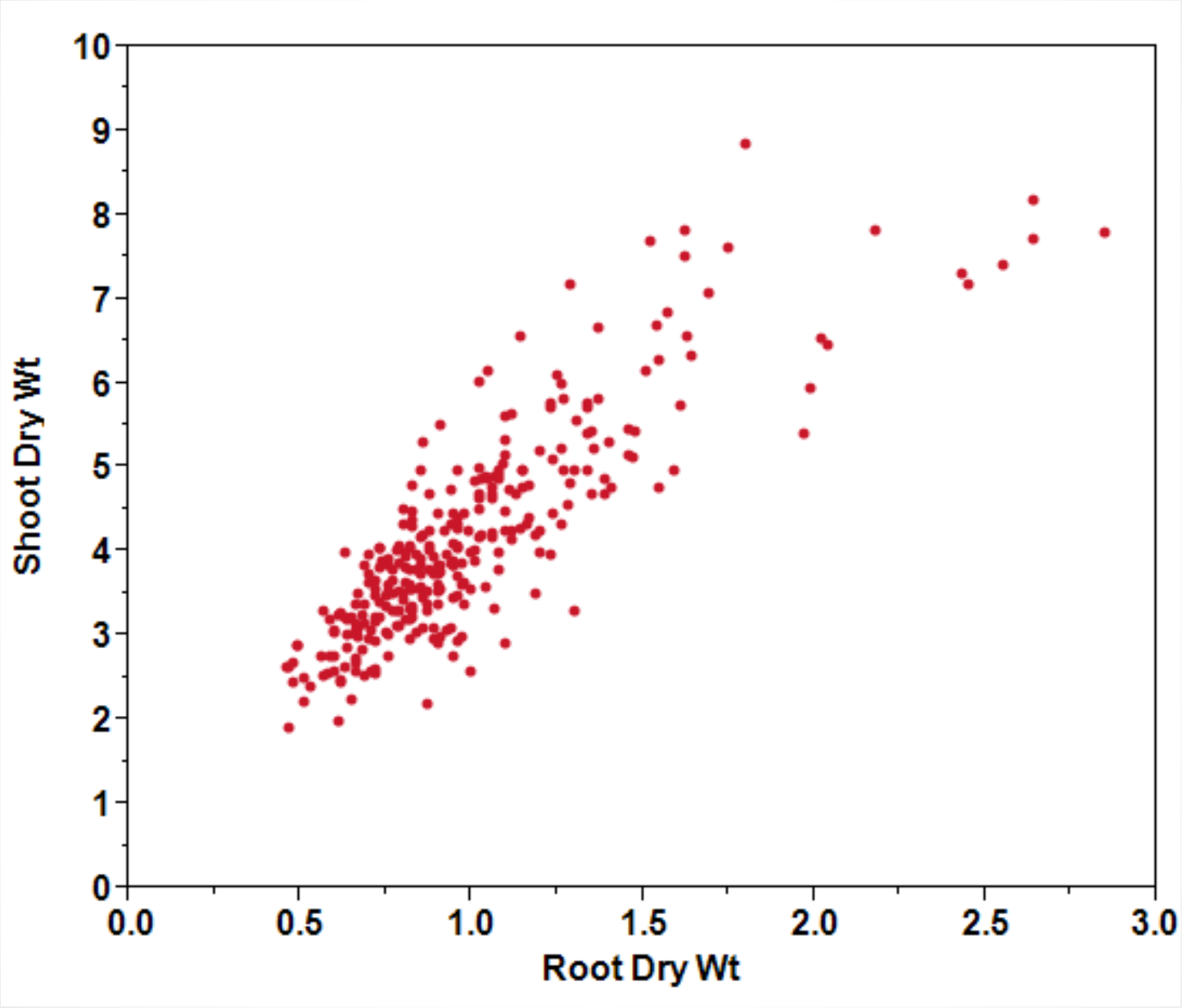
Relationship of RWR and time of lifting



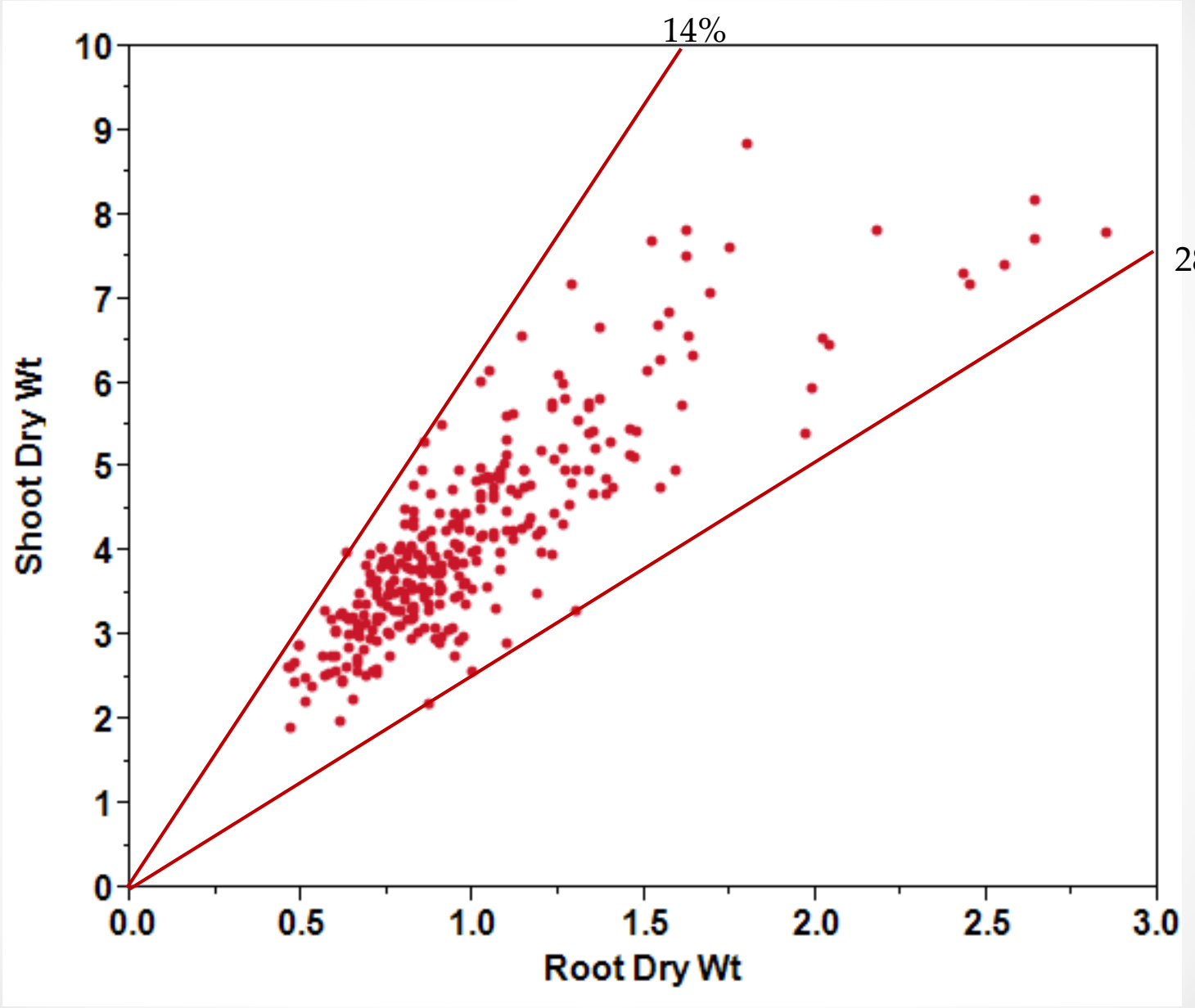
Relationship of RWR to survival



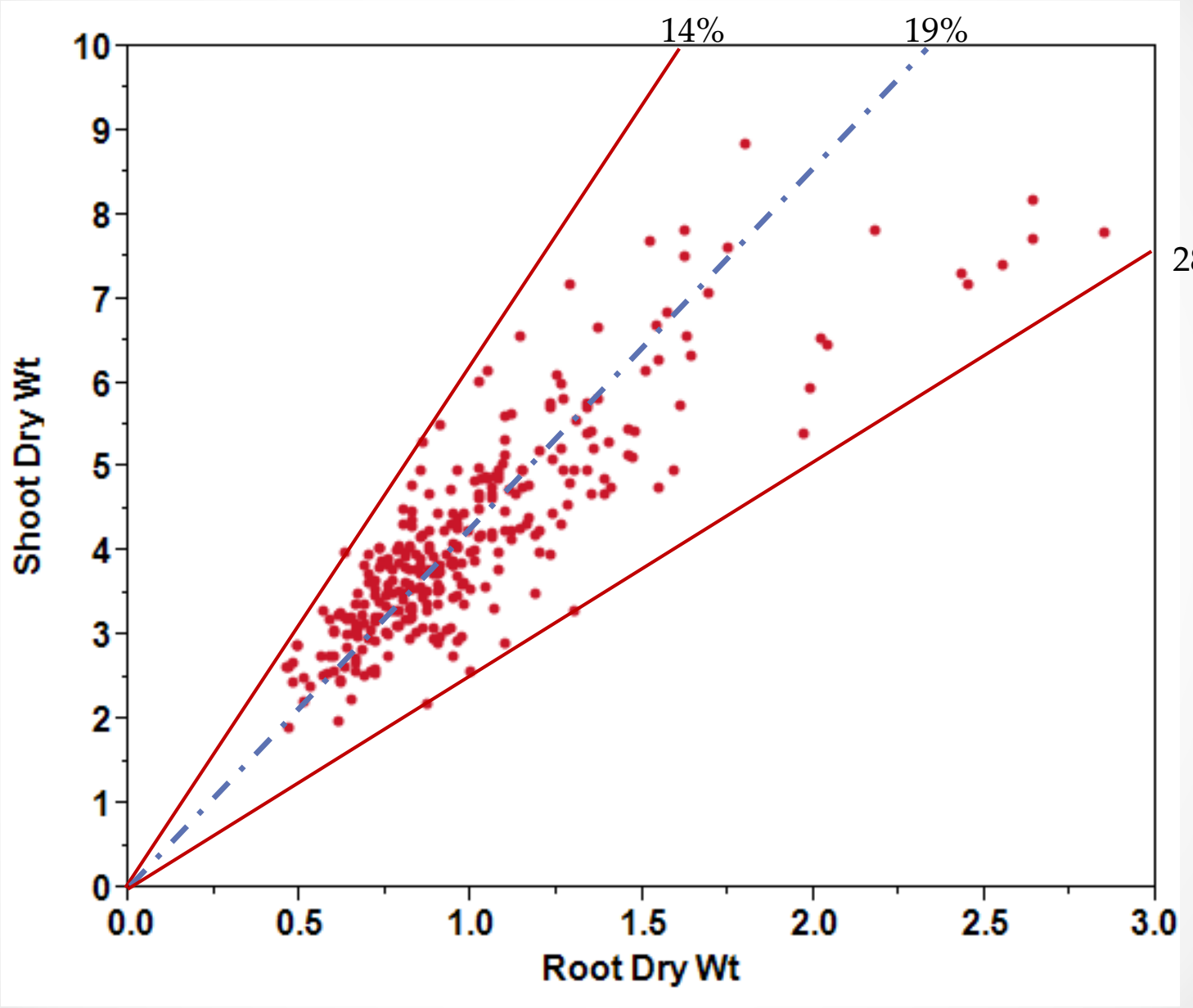
Root Weight Ratios



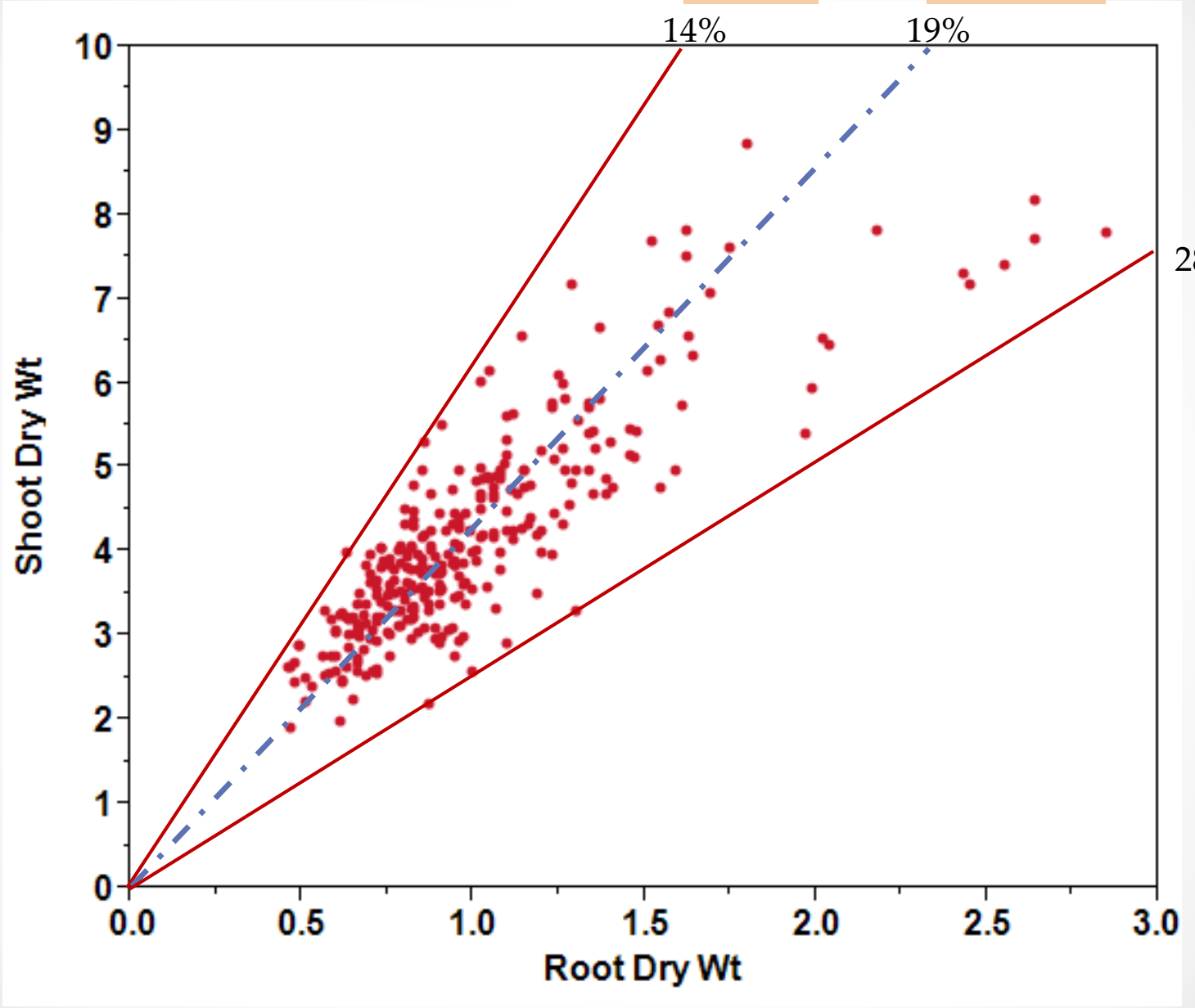
Root Weight Ratios

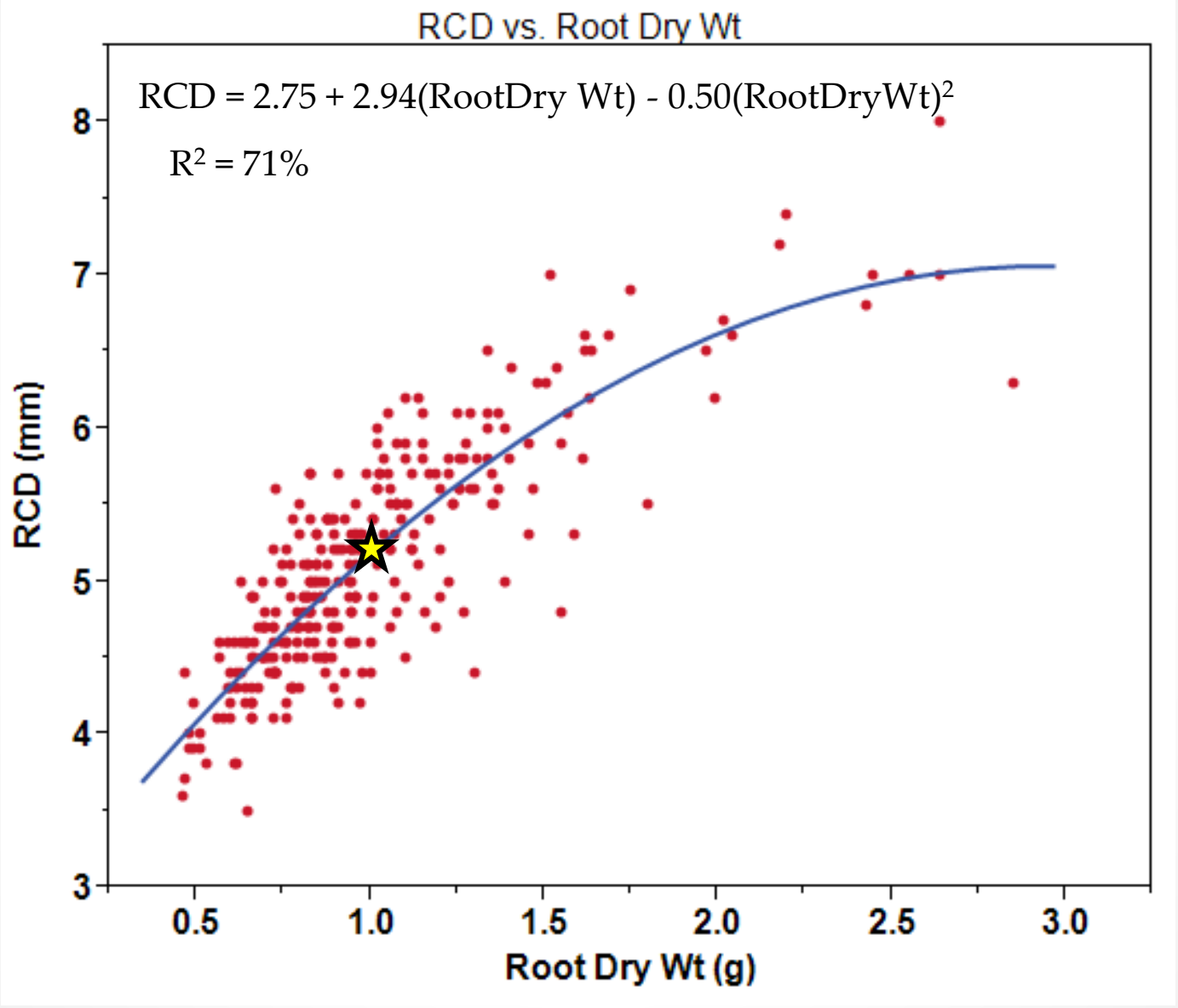


Root Weight Ratios



Root Weight Ratios




RCD vs. Root Dry Wt
RCD = 2.75 + 2.94(RootDry Wt) - 0.50(RootDryWt)2
R2 = 71%
RCD (mm)
8
7
6
5
4
3
0.5
1.0
1.5
2.0
2.5
3.0
Root Dry Wt (g)

Comparison of BR & CS

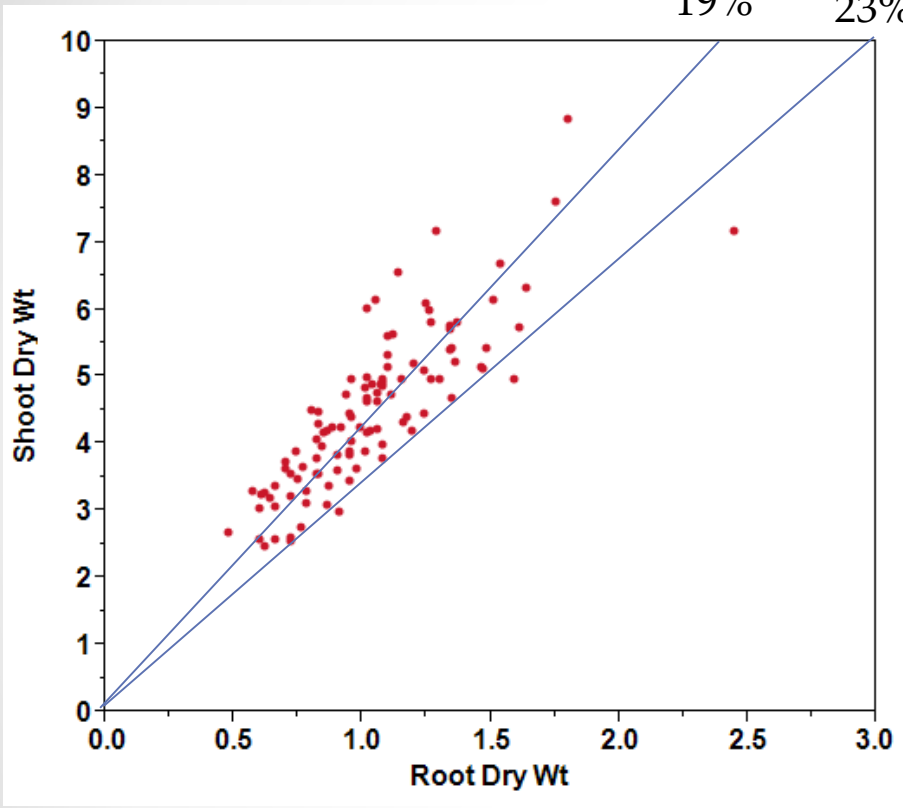
Statistic	Bareroot	CV		Container	CV
N	300	-		50	-
RCD (mm)	5.1	14%		4.8	9%
Ht (in)	11.6	11%		12.6	12%
Root Weight Ratio (RWR)	19%	14%		60%	7%
HT:Dia Ratio	58	12%		67	12%
Root Dry Wt (g)	1.00	38%		6.33	19%
Shoot Dry Wt (g)	4.15	30%		4.12	13%
Shoot:Root Ratio (wt)	4.3:1	17%		0.67:1	19%

CV = Coefficient of variation $CV = \frac{s}{\bar{x}} * 100\%$

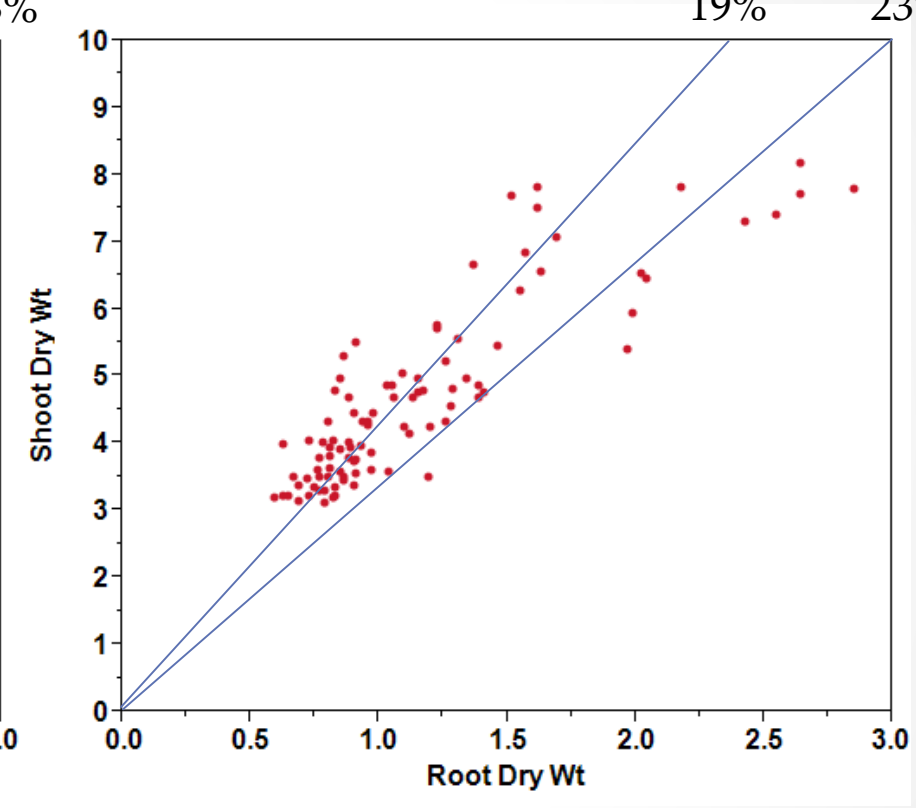
Comparison of BR Genetics

Statistic	Advanced	CV		1,2,3 Gen	CV
N	107			94	
RCD (mm)	5.3	12%		5.5	13%
Ht (in)	11.8	11%		12.2	8%
RWR	19%	12%		19%	15%
HT:Dia Ratio	57	12%		57	11%
Root Dry Wt	1.04	30%		1.14	43%
Shoot Dry Wt	4.49	26%		4.68	29%

Root Weight Ratios and Genetics

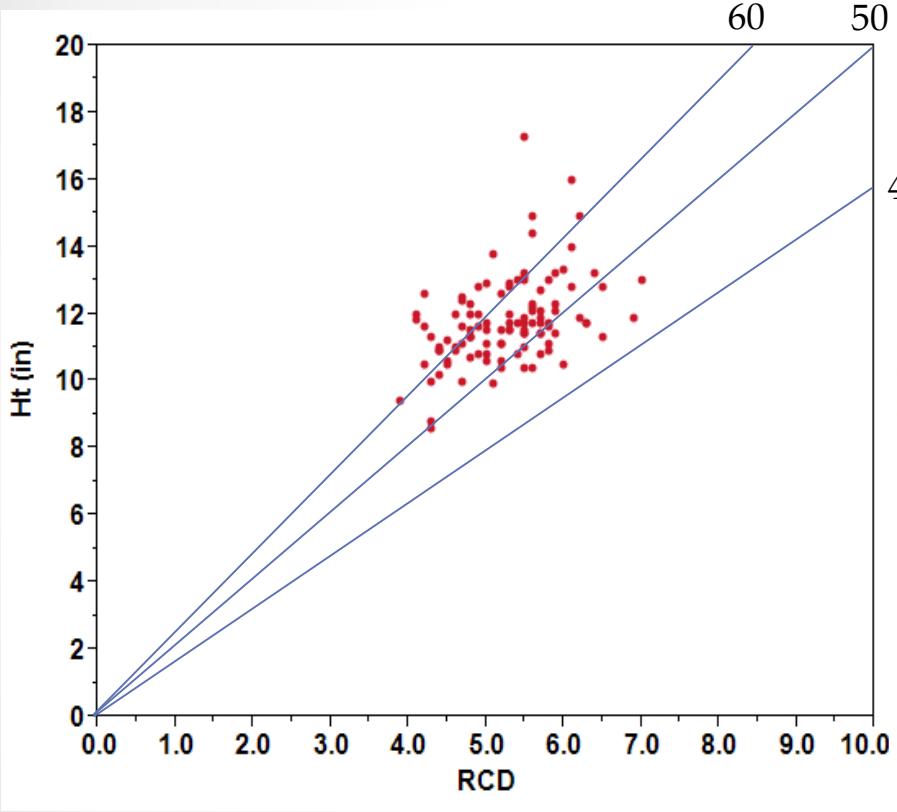


Bareroot Advance

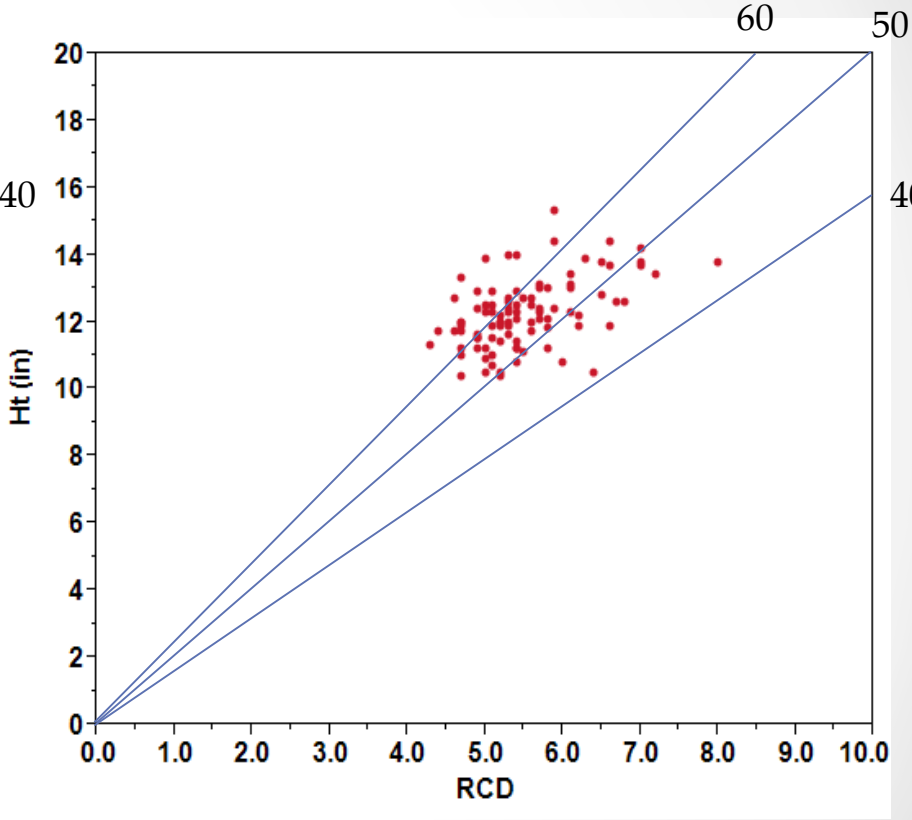


Bareroot 1,2,3 gen

Ht: Dia Ratio by Genetics



Ht:Dia - Adv genetics



Ht:Dia -1,2,3 gen

Summary

- After 300 samples….
  - The characteristics of the "Optimum" seedling is not what we routinely observe.
  - "Optimum" should still be "Optimum" but "Target or Ideal" is more what we observe.
  - Over the last 35 years our seedlings have increased in diameter by 0.2 mm and increased in height by >2 in.
  - CS seedlings averaged 1" taller than BR seedlings.
  - The biggest difference in stock types is in root biomass (CS>BR).
  - Although antidotal observations point to advanced genetic seedlings having smaller root mass than lower genetic seedlings, the evidence for this observation is there, but not strong based on the 300 reports.