

Selection of Dwarf Avocado Trees Within a Population of Seedlings of cv. Colín V-33

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Abstract. An open-pollinated population of 347 nine-year-old seedlings from the dwarf avocado cultivar Colín V-33 was evaluated at Coatepec Harinas, Mexico, to choose those seedlings with promising characteristics, either as dwarf varieties or as dwarfing rootstocks.

Quantitative and qualitative parameters for each tree were evaluated, e.g. height of the tree, canopy and trunk diameter, ratio of canopy diameter to height, vigor, tree shape, and branch distribution, etc. Correlation among the different variables evaluated were analyzed for the purpose of establishing selection criteria.

One priority in avocado research is to find dwarf cultivars that are highly productive with good fruit quality and pest and disease resistance in order to establish high density plantations and to reduce production costs. This was performed in an attempt to address these needs.

Materials and Methods

To determine the main vegetative characteristics of each seedling, the description formulated by Barbabosa (1933) was used. Tree height, growth habit of the tree, canopy and trunk diameter, and the ratio of canopy diameter to height were used to rank the trees and to select those trees which exhibited dwarf habits.

Results and Discussion

In studying 347 seedlings of 'Colín V-33', we found a great diversity of types according to morphological characters (Rubí, 1989). Since the main objective at CICTAMEX is to obtain dwarf cultivars, these characters are presented in relation to tree height.

Vigor types in relation to height. The frequency of three classes of vigor in relation to five classes of height intervals is presented in Table 1. The intermediate height category of 3.50 to 4.59 m predominated, comprising 44% of the total seedlings. However, of greater interest is that 27% were in the dwarf or very dwarf categories. In terms of tree strength, 31% had the low vigor that is an indicator of potential for use as dwarfing rootstocks (Barrientos and López, 1987)

Considering both factors (height and vigor), 41 seedlings (12%) were of maximum interest in that they combined low vigor with dwarf or very dwarf tree height.

Tree shape. The shape is very important because it determines the management practices used in the orchard, so that the spherical, semi-spherical and semi-elliptical forms are advantageous, permitting planting in high density without excessive shading. Distribution frequencies of tree shapes in terms of height is given in Table 2. Note that 111 seedlings exhibited the irregular form, typical of the 'Colín V-33' (Sanchez Colín, 1980).

Canopy diameter. There was a positive correlation between canopy diameter and tree height ($r = 0.56$). Seventy seedlings had a small or very small canopy diameter and were dwarf or very dwarf (Table 3), thus fulfilling the requirements for high density plantings.

Ratio of canopy diameter to height. Growth habit can be defined by the ratio of canopy diameter to tree height. A ratio greater than one indicates more horizontal growth, less than one more vertical growth. Only eleven seedlings had a ratio below one and were also very dwarf (Table 4).

Trunk diameter and height. A positive correlation between trunk diameter and height was found ($r = 0.50$). Barrientos and Lopez (1987) found a negative correlation ($r = -0.91$) between trunk circumference and bark ratio; and also a negative correlation between bark ratio and height of the tree. So we conclude that the 15 seedlings (Table 5) that are both very dwarf and small in trunk diameter can be considered true dwarf trees.

Conclusions

Table 6 lists the qualities that we consider desirable in a search for dwarf cultivars.

Table 7 lists eight outstanding seedling selections. They need to be studied intensively in terms of productivity and fruit quality and also to determine their usefulness as dwarfing rootstocks.

Literature Cited

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Table 1. Frequency of vigor classification in relation to tree height.

Height	Meters	Vigor		
		Very vigorous	Vigorous	Low vigor
Very tall	5.70 – 6.80	0	7	2
Tall	4.60 – 5.69	1	69	20
Medium	3.50 – 4.59	0	106	47
Dwarf	2.40 – 3.49	0	49	31
Very dwarf	1.30 – 2.39	0	5	10

Table 2. Frequency of tree shapes in relation to height.

Shape	Canopy diameter (m)				
	Very tall	Tall	Medium	Dwarf	Very dwarf
Spherical	4	24	27	11	0
Columnar	2	18	10	5	0
Pyramidal	1	14	6	3	0
Obovate	0	2	7	0	0
Rectangular	1	11	20	9	1
Semi-elliptical	0	10	22	4	-
Semi-spherical	0	0	12	10	2
Irregular	1	11	49	38	12

Table 3. Frequency of canopy diameter in relation to height.

Height	Canopy diameter (m)				
	Very big (5.68 – 6.80)	Big (4.56 – 5.67)	Medium (3.44 – 4.55)	Small (2.32 – 3.43)	Very Small (1.20 – 2.31)
Very tall	4	2	2	1	0
Tall	7	29	44	10	0
Medium	5	31	74	37	6
Dwarf	0	5	18	46	11
Very dwarf	0	0	2	7	6

Table 4. Frequency of canopy diameter to tree height ratio in relation to height.

Height	Canopy diameter to height ratio		
	More than 1	Equal to 1	Less than 1
Very tall	7	0	1
Tall	73	0	18
Medium	80	5	68
Dwarf	37	7	37
Very dwarf	3	0	11

Table 5. Trunk diameter in relation to height.

Height	Trunk diameter (cm)		
	Large (24-32)	Medium (15-23)	Small (6-14)
Very tall	3	5	9
Tall	11	58	21
Medium	11	91	51
Dwarf	0	29	51
Very dwarf	0	0	15

Table 6. Desirable characteristics of seedlings.

Trait	Class
Height	Very dwarf to medium (1.30 - 4.6)
Vigor	Low to medium
Canopy diameter to height ratio	More than 1
Trunk diameter	Small (6-14 cm)
Shape	Columnar, spherical, semi-elliptical, semi-spherical and irregular

Table 7. Outstanding very dwarf seedlings.

	Selection							
	413	323	390	170	280	150	196	433
Vigor								
Vigorous	+	+	+			+		
Low vigor				+	+			+
Canopy diameter								
Small		+	+			+		
Very small	+						+	+
Small trunk diameter	+	+	+	+	+	+	+	+
Canopy diameter to height	+	+	+	+	+			
Shape ^z	Irreg	Irreg	Rect	Irreg	Irreg	Irreg	Irreg	Irreg

^z Irreg = irregular; Rect = rectangular