MORPHOLOGIC AND BIOMETRIC OBSERVATIONS ON ALMOND 'TOHANI'CULTIVATED FORMS LEAVES

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ABSTRACT

The paper presents a research model of leaf investigation, based on biometrical measurements and morphological observations. In literature, there are only few studies concerning the biometrical investigation and analysis applied on spontaneous and cultivar plants leaves. The article comprises biometrical investigations on 3 PrunusamygdalusBatsch. (almond) cultivated 'Tohani' forms (cf)*('Tohani P1/7' – Row 1; 'Tohani P23' – Row 3 și 'Tohani 13' – Row 16) leaves. The measurements included: linear measurements, percentage ratios, angular measurementsand other measurements such as the number of teeth/cm, the number semi-sum of secondary pairs of veins and the the leaf surface through which it was possible to determine the size class. The biometric measurements were the basis of a mathematical calculation formua of the average values on the studied genotype. Based on the biometric measurements it could make a more complete morphological characterization of the leaves of this almond cultivars plants.*

Key words:**biometric measurements, lamina, mathematical calculation formula, research model, *Prunusamygdalus*cf**

INTRODUCTION

The leaf, an important vegetative organ of the plant, has been and is extensively studied in morphology and vegetation taxonomy, but in the present study it is biometrically approached, introducing a mathematical model of the biometric average. The biometric method, a relatively new method applied to spontaneous and cultivated species, correlated with the original mathematical model (using generalized mathematical formulas), by the new characters it brings to the leaves, characters not mentioned in the literature, completes the identification and morphological characterization of the leaves almond trees in general and 'Tohani' cultivated forms taken in particular.

MATERIAL AND METHODS

The morphological observations and biometric measurements were performed on 15 mature leaves of *Prunusamygdalus*Batsch cultivated'Tohani' forms (P1/7' – Row 1; P 23' – Row 3 și 13' – Row 16), collected in 5 octomber 2018 from The Fruit Growing Tree Research and Development Station, Constanța Country.

The measurements and the morphological interpretation were performed according to the literature (Andrei, 1997, Bercu, 2005, Dale et al., 1971, Givulescu, 1999, Givulescu and Soltesz, 2000, Mouton 1976, Roth and Dilcher, 1978). Terminology of foliar architecture was taken from Melville (1976) and Dickinson et al. (1978). Calculation formulas for biometric mean valuesare original. The biometric measurements were made on 5 leaves for each almond tree cf 'Tohani', with

the corresponding rows in a total of 15 leaves. For each leaf, 16 measurements were made, counting 240 measurements contained in the tables of this paper.

RESULTS AND DISCUSSION

The biometrical measurements, which had been calculated, are: a. the linear measurements: L- leaf length, l- leaf width, h- the height of the maximum width of lamina; A- the tip length, I-I'- the apex width; Lp- the petiole length, followed by b. the percentage ratios: L/l- the finesse of leaf; A/L- the acuminate ratio, h/L- the ovality ratio; A/I-I'- the lamina apex finesse. c. The angular measurements: α- the apical angle, β- the emergent angle of the secondary veins with primaries, ɣ- the emergent angle of the tertiary veins related to the primary one and finally for other measurements: the number semi-sum of secondary pairs of veins (Np),number of teeth/cm (D) and the lamina surface (S).

As a result of biometric measurements applied on the blade surface, we placed the leaves of the cultivated forms of *Prunusamygdalus*in the size class: notophyllandmicrophyll (Table 1, 2, 3).

In the literature the values of the leaf size class are as follows: leptophyll: 0 - 0,25 cm2; nonophyll: 0.25-2.25 cm^2; microphyll: 2.25 - 20.25 cm^2; notophyll: 20, 25 - 40.0 cm^2; mesophyll: 40-182.25 cm^2, macrophyll 182.2 - 1.640.2 cm^2 and megaphyll over 1.640.2 cm^2.

The values obtained from the biometric measurements were the mathematical basis, respectively generalized mathematical formulas, for each of the five leaves of the 3cultivared forms of *Prunusamygdalus*taken into consideration (Bercu, 2005). Using these data, it was possible directly to calculate the averages of all measurements made on the leaves of each almond tree cultivated 'Tohani' form.

On the basis of the biometric observations, the morphological analysis of 'Tohani'leaves samples taken in the study was carried out with the corresponding rows. The samples of 'Tohani' cultivated forms were analyzed for: P1 / 7 '- Row 1; P23 '- Row 3 and 13 - Row 16.

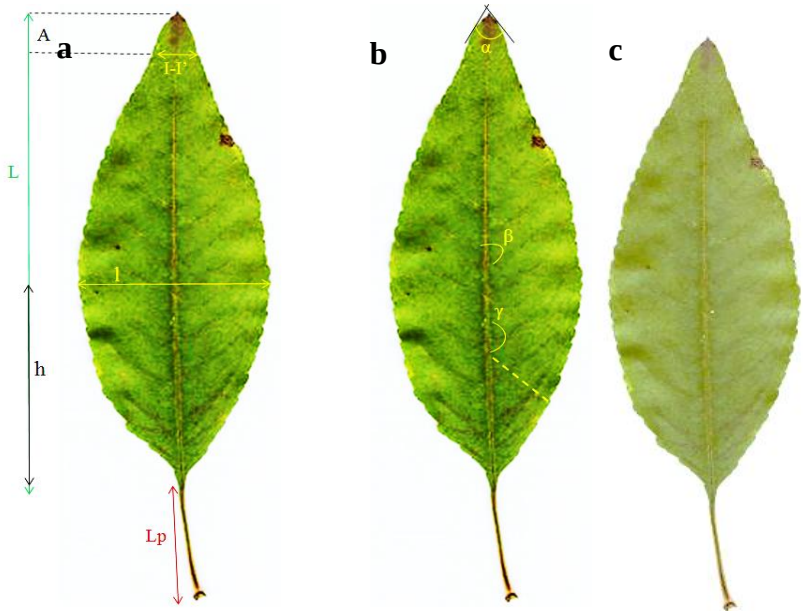

Fig. 1. Leaf of an almond cultivated'Tohani' form.Uper surface with liniar measurements (**a**) and angular measurements (**b**). Lower surface (**c**).

TABLE 1

Biometrical observations on almont leaves of'Tohani 1/7'cultivateform– Row 1

Leaf no.	L mm	l mm	h mm	A mm	l-l' mm	Lp mm	L/l %	A/L %	h/L %	A/l-l' %	α°	β°	γ°	Np/ cm	D/ cm	S cm²	Size class
1	125	40	45	8	5	30	3.12	0.06	0.36	1.60	65	50	138	10	4	33.50	Notophyll
2	110	35	55	7	5	32	3.14	0.06	0.50	1.40	40	60	135	18	5	27.79	Notophyll
3	98	28	48	15	5	23	3.50	0.15	0.48	1.30	45	62	140	21	5	18.38	Microphyll
4	85	26	32	8	8	25	3.26	0.09	0.37	1.00	50	57	132	22	5	14.80	Microphyll
5	117	38	40	15	4	27	3.07	0.12	0.34	1.36	55	56	142	23	6	29.78	Notophyll

TABLE 2

Biometrical observations on almont leaves of 'TohaniP23'cultivate form– Row 3

Leaf no.	L mm	l mm	h mm	A mm	l-l' mm	Lp mm	L/l %	A/L %	h/L %	A/l-l' %	α°	β°	γ°	Np	D/ cm	S cm²	Size class
1	120	43	51	18	14	21	2.79	0.15	0.42	1.28	65	70	110	20	6	34.57	Notophyll
2	110	42	27	14	10	21	2.61	0.12	0.42	1.40	60	65	110	18	6	30.95	Notophyll
3	120	40	50	20	15	22	3.00	0.16	0.41	0.16	56	62	123	23	6	32.16	Notophyll
4	105	36	40	20	12	21	2.91	0.19	0.38	0.19	58	60	120	21	5	25.32	Notophyll
5	120	40	50	20	12	25	3.00	0.16	0.41	1.60	62	63	119	20	6	32.16	Notophyll

TABLE 3

Biometrical observations on almont leaves of'Tohani 13'cultivate form– Row 16

Leaf no.	L mm	l mm	h mm	A mm	l-l' mm	Lp mm	L/l %	A/L %	h/L %	A/l-l' %	α°	β°	γ°	Np	D/ cm	S cm²	Sze class
1	103	43	44	22	22	20	2.39	0.21	0.33	1.00	45	60	120	23	4	29.67	Notophyll
2	93	35	43	15	14	33	2.65	0.16	0.46	1.07	43	75	105	24	5	21.80	Notophyll
3	78	30	32	15	15	20	2.60	0.19	0.41	1.00	42	58	122	18	6	15.67	Microphyll
4	63	26	34	15	18	17	2.42	0.23	0.53	0.83	40	65	115	18	6	10.97	Microphyll
5	87	36	36	17	16	25	2.41	0.19	0.41	1.06	43	60	120	23	5	20.98	Notophyll

The biometric measurements of the 15 leaves (Table 1-3) represented the base for a mathematical calculation average (respectivelymathematical generalized formulas) which accompany each of the 15 leavesfor *Prunusamygdalus*'Tohani' cultivated forms: 1/7' - Row 1 (Table 1), 'Tohani P23' - Row 3 (Table 2) and 'Tohani 13' - Row 16 (Table 3) such as:

Almond 'Tohani 1/7' – R1

a. Linear measurements:

$$\overline{L_{Pa,Tp1/7,R1}} = \sum_{n=1}^{n} \frac{L_{Pa,Tp1/7,R1}}{n} = \frac{L_1 + ... + L_n}{n} = \frac{125 + ... + 117}{5} = 107mm$$

$$\overline{l_{Pa,Tp1/7,R1}} = \sum_{n=1}^{n} \frac{l_{Pa,Tp1/7,R1}}{n} = \frac{l_1 + ... + l_n}{n} = \frac{40 + ... + 38}{5} = 33.40mm$$

$$\overline{h_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{h_{Pa,T1/7,R1}}{n} = \frac{h_1 + ... + h_n}{n} = \frac{45 + ... + 40}{5} = 44mm$$

$$\overline{A_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{A_{Pa,T1/7,R1}}{n} = \frac{A_1 + ... + A_n}{n} = \frac{8 + ... + 15}{5} = 10.60mm$$

$$\overline{I - I'_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{I - I'_{Pa,T1/7,R1}}{n} = \frac{I - I'_1 + ... + I - I'_n}{n} = \frac{5 + ... + 4}{5} = 5.40mm$$

$$\overline{Lp_{Pa,Tp1/7,R1}} = \sum_{n=1}^{n} \frac{Lp_{Pa,Tp1/7,R1}}{n} = \frac{Lp_1 + ... + Lp_n}{n} = \frac{30 + ... + 27}{5} = 27.40mm$$

b. Percentage ratios:

$$\overline{\frac{L}{l}_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\left(\frac{L}{l}\right)_{Pa,T1/7,R1}}{n} = \frac{\left(\frac{L}{l}\right)_1 + ... + \left(\frac{L}{l}\right)_n}{n} = \frac{3.12 + ... + 3.07}{5} = 3.21\%$$

$$\overline{\frac{A}{L}_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\left(\frac{A}{L}\right)_{Pa,T1/7,R1}}{n} = \frac{\left(\frac{A}{L}\right)_1 + ... + \left(\frac{A}{L}\right)_n}{n} = \frac{0.06 + ... + 0.12}{5} = 0.09\%$$

$$\overline{\frac{h}{L}_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\left(\frac{h}{L}\right)_{Pa,T1/7,R1}}{n} = \frac{\left(\frac{h}{L}\right)_1 + ... + \left(\frac{h}{L}\right)_n}{n} = \frac{0.36 + ... + 0.34}{5} = 0.41\%$$

$$\overline{\frac{A}{I - I'}_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\left(\frac{A}{I - I'}\right)_{Pa,T1/7,R1}}{n} = \frac{\left(\frac{A}{I - I'}\right)_1 + ... + \left(\frac{A}{I - I'}\right)_n}{n} = \frac{1.60 + ... + 1.36}{5} = 1.05\%$$

c. Angular measurements:

$$\overline{\alpha_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\alpha_{Pa,T1/7,R1}}{n} = \frac{\alpha_1 + ... + \alpha_n}{n} = \frac{65 + ... + 55}{5} = 51^o$$

$$\overline{\beta_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\beta_{Pa,T1/7,R1}}{n} = \frac{\beta_1 + ... + \beta_n}{n} = \frac{50 + ... + 56}{5} = 44.72^o$$

$$\overline{\gamma_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{\gamma_{Pa,T1/7,R1}}{n} = \frac{\gamma_1 + ... + \gamma_n}{n} = \frac{138 + ... + 142}{5} = 137.40^o$$

d. Other measurements:

$$\overline{Np_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{Np_{Pa,T1/7,R1}}{n} = \frac{Np_1 + ... + Np_n}{n} = \frac{10 + ... + 23}{5} = 18.80 nr/2nv.\sec.$$

$$\overline{D_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{D_{Pa,T1/7,R1}}{n} = \frac{D_1 + ... + D_n}{n} = \frac{4 + ... + 6}{5} = 5 d/cm$$

$$\overline{S_{Pa,T1/7,R1}} = \sum_{n=1}^{n} \frac{S_{Pa,T1/7,R1}}{n} = \frac{S_1 + ... + S_n}{n} = \frac{33.50 + ... + 29.78}{5} = 24.85 cm^2$$

Size class:notophyll

<u>Almond 'Tohani P23' – R 3</u>

a. Linear measurements:

$$\overline{L_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{L_{Pa,TP23,R3}}{n} = \frac{L_1 + ... + L_n}{n} = \frac{120 + ... + 120}{5} = 115 mm$$

$$\overline{l_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{l_{Pa,TP1/7,R1}}{n} = \frac{l_1 + ... + l_n}{n} = \frac{43 + ... + 40}{5} = 40.20 mm$$

$$\overline{h_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{h_{Pa,TP23,R3}}{n} = \frac{h_1 + ... + h_n}{n} = \frac{51 + ... + 50}{5} = 43.60 mm$$

$$\overline{A_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{A_{Pa,TP23,R3}}{n} = \frac{A_1 + ... + A_n}{n} = \frac{18 + ... + 20}{5} = 17.80 mm$$

$$\overline{I-I'_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{I-I'_{Pa,TP23,R3}}{n} = \frac{I-I'_1 + ... + I-I'_n}{n} = \frac{14 + ... + 12}{5} = 12.60 mm$$

$$\overline{Lp_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{Lp_{Pa,TP23,R3}}{n} = \frac{Lp_1 + ... + Lp_n}{n} = \frac{21 + ... + 25}{5} = 22 mm$$

b. Percentage ratios:

$$\overline{\frac{L}{l}_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\left(\frac{L}{l}\right)_{Pa,TP23,R3}}{n} = \frac{\left(\frac{L}{l}\right)_1 + ... + \left(\frac{L}{l}\right)_n}{n} = \frac{2.79 + ... + 3}{5} = 2.86\%$$

$$\overline{\frac{A}{L}_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\left(\frac{A}{L}\right)_{Pa,TP23,R3}}{n} = \frac{\left(\frac{A}{L}\right)_1 + ... + \left(\frac{A}{L}\right)_n}{n} = \frac{0.15 + ... + 0.16}{5} = 0.15\%$$

$$\overline{\frac{h}{L}_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\left(\frac{h}{L}\right)_{Pa,TP23,R3}}{n} = \frac{\left(\frac{h}{L}\right)_1 + ... + \left(\frac{h}{L}\right)_n}{n} = \frac{0.42 + ... + 0.41}{5} = 0.40\%$$

$$\overline{\frac{A}{I-I'}_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\left(\frac{A}{I-I'}\right)_{Pa,P23,R3}}{n} = \frac{\left(\frac{A}{I-I'}\right)_1 + ... + \left(\frac{A}{I-I'}\right)_n}{n} = \frac{1.28 + ... + 1.60}{5} = 0.92\%$$

c. Angular measurements:

$$\overline{\alpha_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\alpha_{Pa,TP23,R3}}{n} = \frac{\alpha_1 + ... + \alpha_n}{n} = \frac{65 + ... + 62}{5} = 60^o$$

$$\overline{\beta_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\beta_{Pa,TP23,R3}}{n} = \frac{\beta_1 + ... + \beta_n}{n} = \frac{70 + ... + 63}{5} = 63.60^o$$

$$\overline{\gamma_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{\gamma_{Pa,TP23,R3}}{n} = \frac{\gamma_1 + ... + \gamma_n}{n} = \frac{110 + ... + 119}{5} = 116.40^o$$

d. Otther measurements:

$$\overline{Np_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{Np_{Pa,TP23,R3}}{n} = \frac{Np_1 + ... + Np_n}{n} = \frac{20 + ... + 20}{5} = 20.40 nr/2nv.\sec.$$

$$\overline{D_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{D_{Pa,TP23,R3}}{n} = \frac{D_1 + ... + D_n}{n} = \frac{6 + ... + 6}{5} = 5.80 d/cm$$

$$\overline{S_{Pa,TP23,R3}} = \sum_{n=1}^{n} \frac{S_{Pa,TP23,R3}}{n} = \frac{S_1 + ... + S_n}{n} = \frac{34.57 + ... + 32.16}{5} = 31.03 cm^2$$

Size class: notophyll

Almond ‘Tohani 13’ - R 16

a. Linear measurements:

$$\overline{L_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{L_{Pa,T13,R3}}{n} = \frac{L_1 + ... + L_n}{n} = \frac{103 + ... + 87}{5} = 84.80 mm$$

$$\overline{l_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{l_{Pa,T13,R3}}{n} = \frac{l_1 + ... + l_n}{n} = \frac{43 + ... + 36}{5} = 34 mm$$

$$\overline{h_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{h_{Pa,T13,R16}}{n} = \frac{h_1 + ... + h_n}{n} = \frac{44 + ... + 36}{5} = 27.80 mm$$

$$\overline{A_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{A_{Pa,T13,R16}}{n} = \frac{A_1 + ... + A_n}{n} = \frac{22 + ... + 17}{5} = 17 mm$$

$$\overline{I - I'_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{I - I'_{Pa,T13,R16}}{n} = \frac{I - I'_1 + ... + I - I'_n}{n} = \frac{22 + ... + 16}{5} = 17 mm$$

$$\overline{Lp_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{Lp_{Pa,T13,R16}}{n} = \frac{Lp_1 + ... + Lp_n}{n} = \frac{20 + ... + 25}{5} = 23 mm$$

b. Percentage ratios:

$$\overline{\frac{L}{l}_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{\left(\frac{L}{l}\right)_{Pa,T13,R16}}{n} = \frac{\left(\frac{L}{l}\right)_1 + ... + \left(\frac{L}{l}\right)_n}{n} = \frac{2.39 + ... + 2.41}{5} = 2.49\%$$

$$\overline{\frac{A}{L}_{Pa,T13,R16}} = \sum_{n=1}^{n} \frac{\left(\frac{A}{L}\right)_{Pa,T13,R16}}{n} = \frac{\left(\frac{A}{L}\right)_1 + ... + \left(\frac{A}{L}\right)_n}{n} = \frac{0.21 + ... + 0.19}{5} = 0.19\%$$

$$\overline{\frac{h}{L}}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{\left(\frac{h}{L}\right)_{Pa,T13,R16}}{n} = \frac{\left(\frac{h}{L}\right)_1 + ... + \left(\frac{h}{L}\right)_n}{n} = \frac{0.33 + ... + 0.41}{5} = 0.43\%$$

$$\overline{\frac{A}{I-I'}}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{\left(\frac{A}{I-I'}\right)_{Pa,T13,R16}}{n} = \frac{\left(\frac{A}{I-I'}\right)_1 + ... + \left(\frac{A}{I-I'}\right)_n}{n} = \frac{1 + ... + 1.06}{5} = 0.99\%$$

c. Angular measurements:

$$\overline{\alpha}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{\alpha_{Pa,Tp13,R16}}{n} = \frac{\alpha_1 + ... + \alpha_n}{n} = \frac{45 + ... + 43}{5} = 42.60^o$$

$$\overline{\beta}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{\beta_{Pa,T13,R16}}{n} = \frac{\beta_1 + ... + \beta_n}{n} = \frac{60 + ... + 60}{5} = 63.60^o$$

$$\overline{\gamma}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{\gamma_{Pa,T13,R16}}{n} = \frac{\gamma_1 + ... + \gamma_n}{n} = \frac{120 + ... + 120}{5} = 116.40^o$$

d. Other measurements:

$$\overline{Np}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{Np_{Pa,T13,R16}}{n} = \frac{Np_1 + ... + Np_n}{n} = \frac{23 + ... + 23}{5} = 21.20 nr / 2nv.\text{sec}$$

$$\overline{D}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{D_{Pa,T13,R16}}{n} = \frac{D_1 + ... + D_n}{n} = \frac{4 + ... + 5}{5} = 5.20 d / cm$$

$$\overline{S}_{Pa,T13,R16} = \sum_{n=1}^{n} \frac{S_{Pa,T13,R16}}{n} = \frac{S_1 + ... + S_n}{n} = \frac{29.67 + ... + 20.98}{5} = 19.81 cm^2$$

Size class: microphyll

Morphological analyses of the leaves of almond cultivar forms‘Tohani 1/7’ (T1) – R 1,‘Tohani P23’(T2) – R 3,‘Tohani 13’ (T3) – R 16

The dominant lamina in the size class, on average, is notophyll (T1 - S = 24.85 cm^2, T2 - S = 31.03 cm^2, T3 = 24.15 cm^2) and occasionally microphyll (T1 S = 16.59 and T3 S = 13.32 cm^2) ended in an narrow acutely moderate fine apex (average α: T1 = 51º; T2 = 60º) and acutely narrow apex (average T3 = 42.60º), fine (A / I-I: T1 = 1.05%, T2 0.92%, T3 0.99%) with a slightly asymmetrical base and serrate margin, with an average number of 5-6 teeth/cm (Fig. ; Table 1-3).

The leaves are dark green on the upper face and slightly lighter green on the lower side, both sides being glabrous. The texture of the laminas are coriaceous. The green cylindrical glabrous petiole has the flowing dimensions: average T1-27.40; T2- 22 mm and T3 = 23 mmlength (Fig. 1; Table 1-3).The shape of the lamina is oblong-lanceolate (the maximum width is in the lower part of the blade) and a subunit ovality ratio (h / L: T1 = 0.41%, T2 = 0.40%, T3 = 0.43%) with the asymmetric light base and the serrate margin average with a number of 5close to 6 teeth / cm.

The primary vein is straight, green, and is simple craspedodrom

type (the secondary veins end in the teeth margins of the lamina – intra-marginal) (Andrei, 1997; Dale et al., 1971; Givulescu, 1999). From the primary vein, the second (second order) veins are detached and have the average number of 5, representing the half of the number of pairs of secondary veins (Np) for all 3 'Tohani'forms.

The angle of emergence of the secondary veins relative to the primary veins (β) is usually moderately acute (T2, T3 = 63.60º) or acutely narrow (T1 = 44.72º) (Fig.1, b, Table 1-3), increasingfrom the base to the apex.

Tertiary veins (order 3) have a constant oblique disposition, forming an obtuse angle (c) highfor T1 = 137.40º and lower value for T2, T3 = 116.40º, generallydecreasingfrom the apex to the base.

The lamina average dimensions are: L - T1 = 107 mm; T2 = 115 mm; T3 = 84.80

mm; l -T1 = 33.40; T2 = 40.20 mm; T3 = 34 m(Table 1-3).

CONCLUSIONS

Concerning the biometric and morphological analysis of the leaves of the 3 leaves belonging to almond 'Tohani' cultivated forms (1/7, P23, 13). It is noted that there are no essential differences as follows:

- All leaves of the 'Tohani' cultivar forms are simple pennate with an oblong-lanceolate shaped lamina and serrate margins with a variable number of teeth/cm. Sometimes the base is asymmetrical. The ovality ratio is subunit in all species. The consistency of the lamina is coriaceous and the color is darker on the upper side and lighter of the lower one. Both surfaces lamina are glabrous. The petiole is cylindrical, glabrous, green and short on all leaves of 'Tohani'. The primary vein is straight on all leaves of 'Tohani' studied forms, with a simple craspedodrom type venation.The angle of emergence of the secondary veins relative to the primary veins is usually moderately acute or acutely narrow, increasingfrom the base to the apex.The tertiary veins have a constant oblique disposition, forming an obtuse angle, differ only in the values of the γ angles. The apex of the lamina is acutely narrow and moderately acute in the three 'Tohani' cultivated forms (1/7, P23 and 13), with slight differences in value. The angle of emergence between primary and secondary veins is moderate and acute in all 'Tohani' forms, their values decreasing from base to the apex to the base. The surface leaves of all studied cultivated formshas relatively close average values.

The blade leaf size class, is notophyll, rarely microphyll depending on their surface. The leaf sizes are quite large in length and width at the leaves of all varieties considered.

The foliar morphological characters, based on the biometric values of all the 'Tohani' almondcultivated forms, make these plants, generally adaptable to both semiarid and temperate or if not for arid areas zones.

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