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DERGİSİ

CONSTRUCTION OF STANDARD VOLUME TABLES FOR *Platanus orientalis* L. GROWTH UNDER IRRIGATED CONDITIONS IN NORTHERN IRAQ

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Abstrakt

Using stepwise regression and multiple regression procedures, 11 regression equations were developed, several measures of precision (i.e. standard error precent of the mean, correlation coefficient, mean deviation, aggregate difference and test of overall unbiasedness of estimates, Ohtomo, 1956) were used to screen the set of equations for selecting the best one to be adopted for constructing the particular table and as a result of this the Honer's equation

$$V = D^2/(-210.12 + 30412/H + 22154/H^2)$$

gave higher precision with a standard error precent of mean volume of 13.6, coefficient of correlation of 0.9914 and mean deviation of 6.74 precent.

It may be noted that the inclusion of a measure of form as one of the independent variables, failed in improving the precision of estimates over and above those obtained with diameter at breast height, total height and their different combinations or transformations.

INTRODUCTION

Platanus orientalis L. is considered to be a valuable timber tree with a considerable future n the forestry of Iraq (Raeder, 1969). It is fast growing species, generally well adopted to the climate and soil conditions existing in the irrigated plantations of northern Iraq. The wood of this species has often a very beautiful figure and accordingly is in much demand for furniture making, penelling and plywood manufacture, being fast growing, easy to regenerate by coppices and having multipurpose utility. Platanus in recent years has become very popular as in important plantation tree.

In the view of the incereasing economic importance of the species, it was considered expedient to construct standard volume table for the species, so that they could be used by the practising foresters and others involved forestry trade to carry out day to day business convencially and effectively, these handy tools will also be extensively utilized for accurately assessing the standing volume of the growing stocks which constitute the back-bone information for sound and scientific management planning of the existing species stands.

Further, this table will prove to be of considerable value in the economical evaluation (i.e. in calculating present worth) of stands of species as compared with others.

In formulating this volume table the up to date objective methodology in their production is used, so that unbiased and precise estimates of the dependent variables are obtained, to achieve this end, procedures and techniques proposed in Cunia (1964), Draper and Smith (1966), Loetsch, Zöhrer and Haller (1973) and others were employed to test different types of mathematical function for selecting the best one to form the bases of constructing the above mentioned table.

REVIEW OF LITERATURE

Malik, Habibullah and Hussain (1971) tested a number of regression models on the data of four coniferous species of Azad Kashmir, they found that on the whole the equation having D, H and F(form quotient) yielded more precise estimates of volume as compared to the equations having D and H or their various combinations as independent variables, they found that the Honer equation and logarithm c one gave the best estimates of the dependent variables.

Blenger (1973) proposed a technique by which a unique linear predictor is found to construct volume tables for different tree species.

Saeed, Malik and Youkhana (1973) tested three different functions to construct local volume tables for **Eucalyptus camaldulensis** Dehn. grown under irrigated conditions in Iraq.

Hussain and Zaheer (1975) tested four regression equations for developing a standard volume table, they used standard error of estimate, coefficient of correlation, aggregate difference percent, mean deviation percent, sum of square ratio of residuals to actual volume and Chi-square as indices of the best fit.

MATERIALS AND METHOD

During summer 1976, 151 trees of **platanus orientalis** well distributed over and covering the entire range of diameter, were felled in the Ninevah forest plantation, the diameters of these trees ranged from 5.4 - 31.5 cm and the height from 8.3 - 24.1 m.

The trees selected in the sample were as far as possible normal trees of the stand and free from defects including forking.

A formate was prepared for recording individual tree data which constitute diameter at breast height, total height, double bark thickness, stem volume up to 4 cm top, diameter and branch wood volume.

All stem and branch diameters were measured in centimeters nearest to one decimal place, tree height and the lenght of stem as well as branch sections were recorded correctly to one decimal place of a meter.

Bark thickness was measured in millimeters and obtained by adding the bark thicknesses of samples taken in two directions at right angles to one another at breast height only.

No attempt was made to take bark thickness samples at points on the stem above breast height because the young **Platanus orientalis** L. forest grown as a plantation by a very thin bark even at breast height and accordingly its negligible effect was considered to have no practical importance on the solid wood volume of individiual trees.

After felling each tree, its height was measured by metalic tape from breast height point to the tip of the leading shoot and 1.3 meter was added to this figure in order to get total height, upper diameter at half of the total height was measured each tree stem was cut with hand saw into sections of 2-meter lenght except the top most section and the butt log which was always 1.3 meter in lenght.

All stem and branch sections were measured for volume determination upto a top diameter of 4 cm. on each section three diameters over bark i.e. at big, middle and small and were taken by diameter tape so that individual tree volumes could be calculated by Newton's formula.

CONSTRUCTION TECHNIQUE

The following computer programmes were used to develop regression equation between the volume or its transformations as dependent variable and diameter at breast height and total height and several transformations as independent variables :

1 — A computer programme developed locally to handle the stepwise regression procedure as mentioned in Draper and Smith (1966).

2 — The usual multiple regression procedure given in scientific subroutine, by which regression coefficents, simple correlation coefficient, standard errors of regression coefficients.

3 — A computer programme which lists for a particular regression equations estimates of the dependent variable in the original form i.e. V instead of log V, D^2/V corresponding to given values of the independent variables.

RESULTS AND DISCUSSION

The following procedures were used to screen various functions and finally select the one yielding the best fit to our data :

1 — The non weighted functions :

a — The stepwise regression functions :

Four volume functions were developed in which dependent variables used were V, log V, D^2/V and D^2H/V while the independent variables included were D*, D^2, D^3, D^4, 1/D, $1/D^2$, log D, $(\log D)^2$, H, log H, 1/H, H/D, $1/H^2$, D^2H, DH, $(\log H)^2$, DH^2, Du*, log Du, $F'D^2H$ and D^2/F'.

The calculated regression equations on the pattern of the above modeles, together with their different measures of precision are presented in table (1), but for the regression model $D^2H/V = a + b \log D + c \log H$ which was rejected as it gave a very poor fit resulting in high standard error percent and exceedingly low R^2 value (15.54 %).

b — Direct functions :

Some of the popular unweighted volume functions used by mensurationists of different countries (Spurr, 1952; Husch, 1963; and Loetsch et al (1973) were chosen for testing, these are listed under the numbers 4-10 in table (1).

2 — The weighted function :

One simple non logarithmic regression model was selected $V = a + b\,D^2H$ in developing the weighted function, each observation was weighted by $1/D^2H$ on the assumption that volume variance increased proportionately with the increase of size of tree (D^2H), the calculated regression equation is shown in table (1) under number 11.

SELECTION PROCEDURE

On the visual examination of different measures of precision given in table (1), equations, 2, 8, 9 and 10 were rejected because of their high standard error and mean deviation as well as comparatively lowR/R'.

Among the remaining equations 1, 3, 4, 5, 6, 7 and 11 there seemed to be practically no d fferences as far as the estimate of R/R' are concerned, however the standard error of equations 1 and 3 being higher in comparison with the others in the subset, these equations were also rejected.. Incidently, it is pointed out that the mean deviation percent for equation 1 was also slightly on the higher side.

As the standard errors of the left over set equations, 4, 5, 6, 7 and 11 were reasonably close to each other in the range of 13.1 - 13.6 %, further analysis was carried out to test for overall unbiasedness of estimates given by each of these equation throughout the range of data (Ohtomo, 1956 and Prodan 1968) by assuming the model, $\hat{V} = n + mV$, in this model, when $\hat{V} = V$, n should be equal to zero and m equal to 1, Table (2). This implies that the straight line depicting the relationship between $\hat{V}$ and V will be inclined at an angle of 45 from both exes as well as pass through the original (Table 2 and Figure 1). The sample estimates of n and m for the compet ng equations

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* D = diameter at breast height in centimeter
Du = diameter at half of total height
F' = normal form quotient

Table(1). Standart volume table regression equations with their respective measures of precision.

S t No. (1)	Regression equation (2)	R (3)	R' (4)	Residual SS (5)	S.E % (6)	S.E % (7)	M.D. (8)
	(i) Stepwise regression equations :						
1.	$V = -0.012355082 + 0.0000384221\, D^2H + 0.1381234/H$	0.9888	—	0.111064	15.62	—	7.18
2.	$D^2/V = 11357.342 - 5394.9676\, (\log H) + 1.9890502\, H^3 - 5427.8953\, (\log D) + 1901.6033\, (\log D)^2$	0.9338	0.9903	0.130675	11.23	14.92	6.67
3.	$\log V = -4669531 + 2.262949\, (\log D) + 1.018433\, (\log H) - 0.0003049273\, H^3$	0.9805	0.9909	0.112201	3.34	13.77	6.65
	(ii) Unweighted regression equations :						
4.	$V = -0.0120483 + 0.0033138\, D - 0.00019322\, D^2 + 0.000046344\, D^2H - 0.00012927\, DH$	0.9911	—	0.110316	14.16	—	7.30
5.	$\log V = 4.7476 + 1.8675\, (\log D) + 1.3628\, (\log H)$	0.9861	0.9910	0.101639	6.94	13.93	7.41
6.	$\log V = 4.48884 + 8515\, (\log D) + 0.33582\, (\log H) - 0.29939\, (\log D)^2 + 0.19032\, (\log H)^2$	0.9927	0.9915	0.103596	5.84	13.28	6.54
7.	$D^2/V = (-210.12 + 30412/H + 22154/H^2)$	0.9396	0.9914	0.110083	11.07	13.60	6.74
8.	$V = -0.0242358 + 0.0002057\, D^2 + 0.00002891\, D^2H + 0.0008976\, H$	0.9851	—	0.14464	15.64	—	31.76
9.	$\log V = -4.86114 + 0.97266 \log D + 1.7931 \log H + 0.62961\, (\log Du)$	0.9785	—	0.216396	8.63	19.13	11.96
10.	$V = -0.0053152 + 0.000038068\, D^2H$	0.9917	—	0.111451	13.64	—	8.52
	(iii) Weighted regression equations :						
11.	$V = -0.00163605 + 0.00003708515\, D^2H$	0.9918	—	0.10578	13.28	—	6.51

D = diameter at breast height. (göğüs çapı)
H = Total height of tree (ağaç boyu)
V = Volume of tree (ağaç hacmı)

Table (2). Standard volume table regression equation and their test of unbiasedness.

S 1. No.	Regression equation	Sample regression coefficient of the model, $\hat{V} = n + mV$		Calculated «t» value	
		«n»	«m»	«n*»	«m*»
4.	$V = -0.0120483 + 0.0033138\,D - 0.00019322\,D^2 + 0.000046344\,D^2H - 0.00012927\,DH$	0.002151	0.981205	0.057508	—0.146027
5.	$\log V = -4.7476 + 1.8676\,(\log D) + 1.3628\,(\log H)$	0.009664	0.917383	0.269278	—0.66960
6.	$\log V = -4.48884 + 2.8515\,(\log D) + 0.33582\,(\log H) - 0.29939\,(\log D)^2 + 0.19032\,(\log H)^3$	0.005593	0.953561	0.154529	—0.372788
7.	$D^2/V = (-210.12 + 30412/H + 22154/H^2)$	0.003027	0.974189	0.081132	—0.201036
11.	$V = -0.00163605 + 0.00003708515\,D^2H$	0.006342	0.957125	0.173380	—0.338299

* «n» and «m» are not significant at 5% level ($P \leq 0.05$).

«n» ve «m» 5% düzeyinde signifikant değildir.

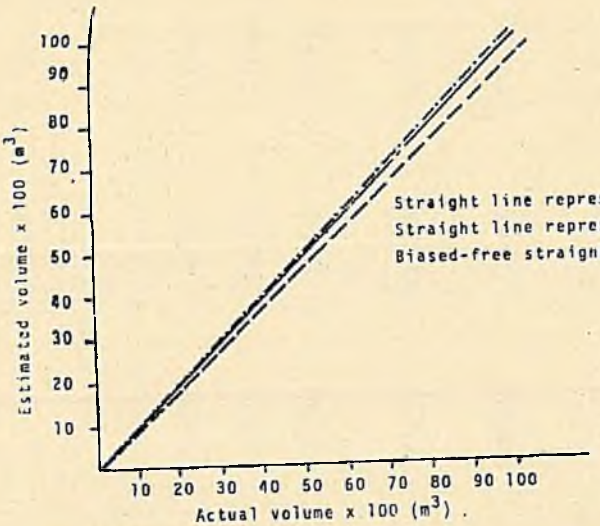

Fig. (1) Relative unbiasedness of eq. 7 and 11 in estimating actual volume as adjudged on the basis of assuming model $\hat{V} = n + mV$. Note that the line representing equation 7 almost coincides on the completely biased-free line at 45 degrees to both axes and passing through the origin.

4,5,6.7 and 11 are shown in table 4. The t-test showed that the estimates of n in respect of all these equations were not significantly different from zero at the % 5 level of significance. Similarly, though the estimates of m varied from 0.917383 to 0.985121, yet they were not significantly different from 1 at the 5% level.

However, the daviation of estimated m's from 1 calculated by the formula, $(\hat{m}_i - 1)\ 100/\hat{m}_i$, for equations 5 and 6, were found to be — 9.0 and - 4.9%, respectively; these were more than those for equations 4, 7 and 11 having values of 1.9, 2.6 and 4.4% respectively. Accordingly, equations 5 and 6 were screened out from the subset as these were expected to give relatively biased overall estimates of volume. Another reason for discarding-equation 5 was that it yielded a high overall mean deviation of 7.41% (table 1).

After classifiying the data by 2 cm diameter classes, the aggregate difference percent of equations 1, 4, 6, 7 and 11 were worked out by each diameter class. A comparison based on aggregate difference percent for these equations is given in table 3.

Equations 1 and 4 gave estimates such that in eight out of a total of twelve diameter classes comprising the data, the aggregate difference was less than 5%, on the other hand, equations 6, 7 and 11 contained ten of these diameter classes wherein this statistics was less than 5%.

Moreover, the overall aggregate difference percent was the lowest (+ 0.44 %) in case of equation 11, next in the order being equations 7, 4,6 and 1 with the values of + 0.54, — 0.62, + 1.32 and — 1.5%, respectively.

Table (3). Comparsion of aggregate difference between actual and estimated volumes by different local volume table regression equations and diameter classes.

Diameter classes (cm)	V* (m^3X10^{-2})	Equation 3		Equaation 4		Equation 5		Equation 10		Equation 11	
		$\hat{V}$ (m^3X10^{-2})	Aggr. diff. %	$\hat{V}$ (m^3X10^{-2})	Aggr. diff. %	$\hat{V}$ (m^3X10^{-2})	Aggr. diff. %	$\hat{V}$ (m^3X10^{-2})	Aggr. diff. %	$\hat{V}$ (m^3X10^{-2})	Aggr. diff. %
5 — 6.9	0.1001	0.1006	—0.512	0.1022	—1.967	0.1006	—0.714	0.9712	2.992	0.0970	3.099
7 — 8.9	0.3484	0.3369	—3.568	0.3500	—6.385	0.3554	—0.810	0.3569	—2.451	0.3697	—6.020
9 — 10.9	1.0556	0.9833	7.357	1.0017	5.388	1.0292	2.571	1.0360	1.796	1.0684	—1.210
11 — 12.9	1.9603	1.8901	3.716	1.8794	4.306	1.9357	1.270	1.9323	1.439	1.9776	—0.880
13 — 14.9	3.1860	3.2230	—1.149	3.1340	1.658	3.2206	—1.075	3.1985	—0.440	5.2427	—1.786
15 — 16.9	4.3205	4.3955	—1.707	4.1965	2.954	4.2920	0.664	4.2261	2.165	4.2680	—0.070
17 — 18.9	2.6226	2.7281	—3.860	2.5745	1.872	2.6182	0.171	2.5688	2.058	2.5795	1.640
19 — 20.9	1.3991	1.5922	— 12.12	1.4977	—6.570	1.5152	7.659	1.4840	—5.065	1.4822	—5.946
21 — 22.9	1.8541	2.0221	—8.303	1.9128	—3.060	1.9251	—3.680	1.8858	—1.710	1.8763	—1.200
25 — 26.9	2.3456	2.2443	4.510	2.1900	7.600	2.1940	5.913	2.1584	7.960	2.1344	9.000
29 — 30.9	4.6099	4.4208	4.290	4.5890	0.457	4.6149	0.107	4.5823	0.600	4.5066	2.200
31 — 32.9	3.1294	3.1284	0.030	3.3165	—5.640	3.3449	—6.410	3.3213	—6.130	3.2750	—4.650

* V and $\hat{V}$ are respectively actual and estimated volumes.
Gerçek ve denklemden bulunan ağaç hacımları

Equation 1 and 6 also did not meet the desired standard of accuracy proposed by Bruce (1920) because the overall aggregate difference obtained by these was higher than 1%. Though equation 4 competed favourably with equations 11 and 7 in precision, but it was also discarded as it contained four independent variables, while equation 11 had only one and equation 7 two independent variables.

A part form this, equation 4 suffered from the weakness that its mean deviation (table 1) as well as aggregate difference (table 3) were higher than the corresponding statistics of equations 7 and 11.

Equations 7 and 11 were very much comparable to each other in accuracy as adjusted on the basis of standard error, (R) value, mean deviation, aggregate difference and the test of unbiasedness of estimates throughout the range of basic data. Nevertheless, equation 7 was finally selected for constructing the two-way volume table (table 6) as its m value (0.974189) in the model, $\hat{V} = n + mV$, was closer to 1 then that of equation 11 which had the m value of 0.957424. A graphical illustration of the test of unbiasedness for equations 7 and 11 is presented in Figure 1. The greater the departure of a particular straight line (one for equation 7 and the other for equation 11) from the one at an angle of 45° from both axes and passing through the origin, the more biased would be the estimates yielded by this equation. As may be noted in this figure the line respectively equation 7 almost coincides with the standard line, whereas the gap between the line of equation 11 and the standard line becomes with increasing volume, indicative of increasing under estimation as the trees become bigger.

Comparsion of Precision of the Selected Volume equation with the Similar equations Adopted by other Mensurationists :

A brief resume comparing the level of precision of volume equation adopted in this study with those of other research workers in different countries of the world and at home is presented in table 4.

Table 4. Comparison of precision of selected standard volume equation with others adopted by different authors.

Country	Species	Number of trees used	S.E	(R/r)	M.D	Name of the author (s)
Iraq	**Platanus orientalis**	151	13.6	0.9914	6.74	Adopted in the present study
Iraq	**Eucalyptus camaldulensis**	151	—	0.9945	—	Saeed et al. (1975)
Finland	A number of pine species	—	12.1 to 13.4	0.983 to 0.994	—	Vuokilo et al. (1968)
U.S.A.	Paper birch and balsam poplar	128	9.8	—	—	Dippold et al. (1971)
Pakistan	Hybrid poplar (PXE CV 1—214)	—	—	0.97662	10.0	
Canada	Spruce-fir	475		0.981		Smith (1976)
		1317		0.968		

Table (5) Standard volume table for Platanus orientalis. L.

Diameter classes (cm)		Total height classes (m)												
Midpoint	Range	6	7	8	9	10	11	12	13	14	15	16	17	18
		Volume in $m^3 \times 10^{-2}$												
5	4.0 — 5.9	0.29	0.35	0.41	0.46	0.52								
7	6.0 — 7.9			0.91	1.046	1.179	1.315	1.453	1.593	1.735	1.879			
9	8.0 — 9.9				1.859	2.097	2.337	2.583	2.831	3.084	3.341	3.601	3.866	4.136
11	10.0 — 11.9						3.653	4.035	4.424	4.819	5.220	5.627	6.041	6.461
13	12.0 — 13.9							5.811	6.371	6.939	7.516	8.103	8.698	9.203
15	14.0 — 15.9										10.23	11.03	11.83	12.66
17	16.0 — 17.9											14.40	15.46	16.64
19	18.0 — 19.9											18.23	19.57	20.93
21	20.0 — 21.9												24.18	25.84
23	22.0 — 23.9													31.27
25	24.0 — 25.9													37.21

Diameter classes (cm)		Total height classes (m)																
Midpoint	Range	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
		Valume in $m^3 \times 10^{-2}$																
11	10.0 — 11.9	3.653	4.035	4.424	4.819	5.220	5.627	6.041	6.461	6.888	7.321							
13	12.0 — 13.9		5.811	6.731	6.939	7.516	8.103	8.698	9.203	9.918	10.54	11.18						
15	14.0 — 15.9					10.23	11.03	11.84	12.66	13.50	14.35	15.21	16.09	18.98				
17	16.0 — 17.9						14.40	15.46	16.64	17.63	18.74	19.87	21.92	22.18	23.37			
19	18.0 — 19.9						18.23	19.57	20.93	22.32	23.72	25.15	20.58	28.00	29.59			
21	20.0 — 21.9							24.10	25.84	27.55	29.24	31.05	32.34	34.53	36.67	38.39		
23	22.0 — 23.9								31.27	33.34	35.44	37.57	39.74	41.94	44.18	45.46		
25	24.0 — 25.9								37.21	39.67	42.17	44.71	47.29	49.91	52.58	55.29	58.64	
27	26.0 — 27.9									46.56	49.49	52.47	55.56	58.58	61.71	64.59	68.12	
29	28.0 — 29.9									54.00	57.40	60.86	64.37	67.94	71.53	76.23	79.64	
31	30.0 — 31.9									61.99	65.89	69.86	73.39	77.39	32.15	85.30	90.69	95.07

Diameter classes (cm)		Total height classes (m)													
Midpoint	Range	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		Volume in $m^3 \times 10^{-2}$													
33	32.0 — 33.9	74.97	79.48	84.07	88.73	93.47	98.29	103.2	108.2	113.2					
35	34.0 — 35.9	85.64	89.73	94.91	100.2	105.5	111.0	116.5	122.1	127.8	133.7				
37	36.0 — 37.9	94.88	100.6	106.4	112.3	118.3	124.4	130.6	136.9	143.3	143.8				
39	38.0 — 39.9	105.7	112.1	118.6	125.1	131.2	138.6	145.5	152.5	159.7	167.9	174.3			
41	40.0 — 41.9	117.1	124.2	131.4	138.6	146.1	153.6	161.2	169.6	176.9	185.0	193.2	201.6		
43	42.0 — 43.9	129.1	136.9	144.8	152.9	161.0	169.3	177.8	186.3	195.1	204.8	213.5	222.2	231.5	
45	44.0 — 45.9	141.7	150.3	158.9	167.8	176.7	195.8	195.1	204.5	214.1	223.8	233.4	243.6	254.1	
47	46.0 — 47.9	154.9	164.2	173.7	183.3	193.2	203.1	213.2	223.5	234.0	244.5	225.5	226.5	227.7	285.4

(i) Number of trees forming valid data = 151

(ii) Derived from : $V = D^2/(-210.12 + 30412/H + 22154/H^2)$

where : V = total volume overbark of entire stem and branches down to 4 cm average diameter at the thin and, calculated by full basal area.

D = diameter at breast height over bark.

H = total height in meters measured correctly upto one decimal place.

(iii) Mean tree volume (m^3) = 0.2006

(iv) Standard error precent of mean tree volume (%) = $\mp$ 13.6.

(v) Correlation coefficient = 0.9914.

(vi) Mean deviation (%) = $\mp$ 6.74

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KUZEY IRAK'TA SULAK ARAZİDE YETİŞTİRİLEN DOĞU ÇINARI (Platanus orientalis L.) PLANTASYONLARI İÇİN STANDART HACIM TABLOLARININ DÜZENLENMESİ

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Ö z e t

Bu çalışmanın hazırlanmasında IBM 1130 bilgisayarından yararlanılmıştır. Hacım veya hacım dönüşümünü bağlı değişken ve göğüs çapı ile ağaç boyunu veya bunların dönüşümlerini serbest değişken olarak alan, on bir adet regresyon denklemi denenmiştir. Regresyon denklemlerinde katsayıların hesabı için :

1) Stepwise regresyon analizi (DRAPER-SMITH 1966)

2) Çoğul regresyon analizi

3) Serbest değişken değerlerine göre bağlı değişkeni log V, D^2/V gibi dönüşüm değeri yerine doğrudan V gerçek değer olarak verebilen

bilgisayar programları kullanılmıştır. Keza, regresyon denklemlerinin karşılaştırılabilmesi için : standart hata yüzdesi, korelasyon katsayısı, ortalama sapma, birikimli fark hesaplanmış ve istatistik denetimler yapılmıştır.

Materyal olarak, Ninevah orman plantasyonunda kesilen değişik göğüs çapı ve boylardaki 151 deneme ağacının ölçüleri kullanılmıştır. Böylece, Doğu Çınarı standart hacım tablosu için;

(I) Stepwise regresyon

(II) Tartısız regresyon

(III) Tartılı regresyon

yöntemleri ile katsayıları ve kesinlik ölçüleri hesaplanan on bir adet regresyon denklemi elde edilmiştir (Tablo 1). Bu regresyon denklemlerinin karşılaştırılması sonucu, 7 No. lu :

$$V = D^2/(-210,12 + 30412/H + 22154\ H^2)$$

denklemi en uygun bulunmuştur. Gerçekten, HONER tarafından önerilmiş olan bu regres-

yon denkleminden standart hata yüzdesi 13,6 %, korelasyon katsayısı 0,9914 ve ortalama sapma 6,74 % olarak hesaplanmıştır (bak: Tablo 1). Keza;

$$\hat{V} = n + m\,V$$

modelinde n = 0 ve m = 1 olasılığının t-testi (Tablo 2) ve grafik olarak karşılaştırılması (Şekil 1), birikimli farkların 5 % den az olan çap basamağı sayısı (Tablo 3) bakımlarından da formül 7 üstünlük göstermektedir.

Tarafımızdan düzenlenen standart hacım denkleminin diğer ağaç türleri için verilenlerle karşılaştırılması, tablo 4 de gösterilmiştir.

7 No.lu regresyon denkleminden elde edilen Doğu Çınarı standart hacım tabolsu, Tablo 5'de verilmiştir