

TATA INSTITUTE RADIOCARBON DATE LIST VI

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This date list is comprised of archaeological and geophysical samples. The latter are in continuation of our investigations of bomb-produced radiocarbon in atmospheric carbon dioxide reported in Tata V. We continue to count samples in the form of methane; the techniques used have been described elsewhere (Agrawal *et al.*, 1965).

Radiocarbon dates presented below are based on C^{14} half-life value of 5568 yr. For conversion to A.D./B.C. scale, 1950 A.D. has been used as base yr. Our modern reference standard is 95% activity of N.B.S. oxalic acid.

GENERAL COMMENT

Radiocarbon dating in India has been mainly confined to Neolithic and Chalcolithic cultures. Despite the dearth of datable material, attempts at evolving an absolute chronology for Stone-age cultures have now been started. Bone and shell samples were measured for some Microlithic cultures. Rock-shelters of Uttar Pradesh were dated ca. 2400 B.C. (TF-419). Adamgarh rock-shelters were dated ca. 5500 B.C. (TF-120, Radiocarbon, 1968, v. 10, p. 131). Kayatha culture of Madhya Pradesh appears to date from ca. 2000 B.C. Chirand Black-and-Red ware date (TF-444) confirms the earlier dates (Radiocarbon, 1966, v. 8, p. 442). Terdal Neolithic culture was dated ca. 1800 B.C. A megalith from Halingali was dated ca. 100 B.C. Brief summaries of these excavations are available in Ghosh (1961-1966).

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SAMPLE DESCRIPTIONS

I. ARCHAEOLOGIC SAMPLES

TF-415. Atranjikhhera, India, Black-and-Red ware deposits **2450 ± 200
500 B.C.**

Charcoal from Atranjikhhera (27° 42' N Lat, 78° 44' E Long), Dist. Etah, baulk between Trenches E₁ and E₂, Layer 8, depth 0.5 m, Field No.3/1965. Sample subm. by R. C. Gaur, Aligarh Univ., Aligarh. *Comment*: sample is from baulk, hence stratigraphy may be poor. The large errors arise due to insufficiency of datable material.

TF-367. Chandraketurgarh, India, historical deposits **660 ± 90**
A.D. 1290

Shells from Chandraketurgarh Dist. 24-Paraganas, Locus H2, depth 2.6 m, sample No. 2; sample subm. by C. R. Choudhury, Asutosh Mus., Calcutta-14. *Comment:* only inorganic fraction of shells was dated; organic fraction was not sufficient.

Chirand series, Bihar

Chirand (25° 45' N Lat, 84° 45' E Long), Dist. Saran, was excavated by B. S. Verma. Samples subm. by Dir. Archaeol. and Mus., Patna.

TF-444. Black-and-Red ware deposits **2590 ± 105**
640 B.C.

Charred wood from Trench CRD-VII, Locus A2, Layer 16, depth 10.5 m. NaOH pretreatment was also given.

TF-445. Pit with microliths **3500 ± 100**
1550 B.C.

Wood from Trench CRD-X, Locus A2, pit sealed by Layer 11, depth 8.2 m. NaOH pretreatment was also given. *Comment:* sample is from pit in natural soil which yields large number of microliths and is sealed by Black-and-Red ware deposits; could be earlier.

TF-446. Northern Black Polished ware deposits **1930 ± 105**
A.D. 20

Charred rice from Trench CRD-1c, Locus B'-C', Layer 6, depth 3.25 m. NaOH pretreatment was also given. *Comment:* sample derives from top of Northern Black Polished ware deposits.

TF-685. Halingali, India, Megalithic deposits **1970 ± 95**
20 B.C.

Charcoal from Halingali (16° 0' 30" N Lat, 75° 6' 40" E Long), Dist. Bijapur, Locus HGL, Mg III, depth 1.31 to 1.4 m, Field No. HGL, MgIII-24. NaOH pretreatment was also given. Sample subm. by H. D. Sankalia, Deccan College, Poona. *Comment:* date is younger than expected.

Kayatha series, Madhya Pradesh

Kayatha (23° 30' N Lat, 76° E Long), Dist. Ujjain was excavated by V. S. Wakankar, Madhav College, Ujjain, who subm. samples. NaOH pretreatment was given to all samples.

TF-398. Chalcolithic deposits **3520 ± 100**
1570 B.C.

Charcoal from burnt Chalcolithic house, Trench KTH 1, Layer 35, depth 8.5 m, Field No. 7.

TF-405. Chalcolithic deposits **3320 ± 100**
1370 B.C.

Charcoal, Trench KTH2, Layer 10, depth 3.5 m, Field No. 14.

- TF-674. Northern Black Polished ware deposits** **2350 ± 95**
400 B.C.
Charcoal, from Trench KTH4, Layer 11, depth not given, Field No.15. *Comment:* P.G. ware was also assoc.
- TF-676. Chalcolithic deposits** **3160 ± 105**
1210 B.C.
Burnt wheat grains from Trench KTH4, Layer 14, depth not given, Field No. 17.
- TF-678. Chalcolithic deposits** **3530 ± 100**
1580 B.C.
Charcoal from Trench KTH4, Layer 18, Field No.19.
- TF-679. Chalcolithic deposits** **3155 ± 130**
1205 B.C.
Charcoal from Trench KTH3, Layer 9, depth not given, Field No. 20.
- TF-680. Kayatha culture** **3850 ± 95**
1900 B.C.
Charcoal from Trench KTH3, Layer 13, depth not given, Field No. 21.
- TF-586. Hallur, India, Neolithic period** **3055 ± 95**
1105 B.C.
Charcoal from Hallur (14° 20' N Lat, 75° 37' E Long), Dist. Dharwar, Trench 2, pit sealed by Layer 8, depth 2.8 m. Sample subm. by M. S. Nagaraj Rao, Karnatak Univ., Dharwar.
- TF-599. Kalibangan, India, bones** **1930 ± 100**
A.D. 20
Animal bones from Kalibangan (29° 25' N Lat, 74° 05' E Long), Dist. Ganganagar, Locus XA-17 Od.1, Layer 4, depth 0.7 m, Field No. KLB-2, XA-17 Qd.1/c/1965-66-1. Sample subm. by A. Ghosh. *Comment:* C¹⁴ date was obtained only from inorganic fraction and shows extent to which this fraction can be contaminated.
- Lekhahia series, Uttar Pradesh**
Lekhahia rock-shelters (27° 80' 5" N Lat, 82° 32' E Long), Dist. Mirzapur, were excavated by V. D. Misra. Samples subm. by G. R. Sharma, Allahabad Univ., Allahabad. There is no archaeological date estimate available, but assoc. of aceramic geometric and non-geometric microliths indicates that C¹⁴ dates could be younger because only inorganic fraction of bones was dated.
- TF-417. Rock-shelter skeleton** **3560 ± 105**
1610 B.C.
Bones from Rock-shelter I, Skeleton No. VI, Locus 5-7, Layer 4, depth 0.15 m, Field No. LKH(M)RS-1/64/B-2.

- TF-419. Rock-shelter skeleton** **4240 ± 110**
2290 B.C.
Bones from Rock-shelter I, Skeleton No. XVII, Locus 4-7, Layer 8, depth 0.4 m, Field No. LKH(M)RS-1/64/B-4.
- TF-744. Langhnaj, India, Microlithic culture** **3875 ± 105**
1925 B.C.
Bones from Langhnaj (23° 27' E Lat, 72° 32' E Long), Dist. Mehsana, Trench BFGC, depth 1.2 to 1.8 m. Sample subm. by H. D. Sankalia.
Comment: different bones samples R. Nos. 3828, 3921, 4707, 4326, and 5188 from lower and middle levels were mixed for C¹⁴ dating. Only inorganic fraction was dated; contamination probability is high.
- Rajbadidanga series, W Bengal**
Rajbadidanga (24° 01' N Lat, 88° 11' E Long), Dist. Murshidabad, was excavated by S. R. Das, Dept. of Archaeol., Univ. of Calcutta, who subm. samples.
- TF-629. Historical deposits** **1495 ± 90**
A.D. 455
Charcoal from Trench B3, Layer 12A, depth 3.5 m, Field No. 3.
Comment: assoc. finds have terracotta seals.
- TF-634. Historical deposits** **1520 ± 90**
A.D. 430
Charcoal from Trench B5, Layer 8, depth 3.1 m, Field No. 9.
- TF-681. Tripuri, India, Early Historic period** **2155 ± 100**
205 B.C.
Charcoal from Tripuri (23° 8' N Lat, 79° 50' E Long), Dist. Jabalpur, Locus II, Layer 5, depth 2.8 m, Field No. 246. Sample subm. by H. D. Sankalia. Rootlets were handpicked. NaOH pretreatment was also given.
- TF-689. Palmleaf manuscript, India** **40 ± 95**
A.D. 1910
Sample subm. by K. S. Karanth, Puttur, Mysore.
- Terdal series, Mysore**
Terdal (16° N Lat, 75° 5' E Long), Dist. Bijapur. Site is being excavated by A. Sundara, Deccan College, Poona. Samples subm. by H. D. Sankalia.
- TF-683. Neolithic culture** **3615 ± 120**
1665 B.C.
Charcoal from Trench 1, Layer 3, depth .45 to .65 m, Field No. 40.
- TF-684. Neolithic culture** **3775 ± 95**
1825 B.C.
Charcoal from Trench 1, Layer 2, depth .17 to .25 m, Field No. TRDL 28.

Ujjain series, Madhya Pradesh

Ujjain (23° 11' N Lat, 75° 46' E Long), Dist. Ujjain, samples subm. by A. Ghosh, site excavated by N. R. Banerjee.

1990 ± 100**TF-407. Black-and-Red ware deposits****40 B.C.**

Charcoal, Locus O-I, Layer 23, depth 4.4 m, Field No. UJN 17 Ext/108.

2335 ± 95**TF-409. Northern Black Polished ware deposits****385 B.C.**

Charcoal, Locus IV-V, Layer 28, depth 5.50 m, Field No. UJN 28/155.

II. GEOPHYSICAL SAMPLES

C¹⁴ in Atmospheric Carbon Dioxide

Atmospheric CO₂ samples were coll. at 3 stations: 1) Gulmarg (34° 04' N Lat, 74° 25' E Long), alt. 2745 m; 2) Khandala (18° 45' N Lat, 73° 22' E Long), alt. 550 m; 3) Kodaikanal (10° 15' N Lat, 77° 31' E Long), alt. 2300 m. Gulmarg and Kodaikanal series samples are continuation of data published in Tata V. Khandala was new sta., at about same lat. as Bombay, but far away from industrial area.

The following tables give time of exposure of 0.1 N NaOH (carbonate-free) solution to air and observed % excess of C¹⁴ in atmospheric CO₂ samples above reference level of age-corrected 1890 wood, *i.e.*, 0.95 NBS oxalic acid.

TABLE I

Atmospheric Radiocarbon Activity series, Gulmarg

<i>Sample No.</i>	<i>Exposure Dates</i>	<i>δC¹⁴‰</i>
TF-492	June 1, 1965—June 15, 1965	73.74 ± 1.73
TF-497	June 15, 1965—July 1, 1965	76.12 ± 2.02
TF-498	July 1, 1965—July 15, 1965	80.05 ± 1.89
TF-499	July 15, 1965—Aug. 1, 1965	72.59 ± 1.74
TF-652	Sept. 1, 1965—Sept. 10, 1965	71.99 ± 1.79
TF-654	Oct. 1, 1965—Oct. 10, 1965	73.59 ± 1.79

TABLE 2
Atmospheric Radiocarbon Activity series, Khandala

<i>Sample No.</i>	<i>Exposure Dates</i>	$\delta C^{14}\%$
TF-553	Aug. 31, 1965—Sept. 10, 1965	68.72 \pm 1.77
TF-554	Sept. 10, 1965—Sept. 20, 1965	70.78 \pm 1.88
TF-667	Sept. 20, 1965—Sept. 30, 1965	69.25 \pm 1.77
TF-668	Oct. 1, 1965—Oct. 10, 1965	69.93 \pm 1.74
TF-670	Oct. 20, 1965—Oct. 30, 1965	73.11 \pm 1.81

TABLE 3
Atmospheric Radiocarbon Activity series, Kodaikanal

<i>Sample No.</i>	<i>Exposure Dates</i>	$\delta C^{14}\%$
TF-540	June 1, 1965—June 16, 1965	73.06 \pm 1.77
TF-542	July 1, 1965—July 16, 1965	70.55 \pm 1.75
TF-658	Aug. 1, 1965—Aug. 10, 1965	68.40 \pm 1.74
TF-660	Sept. 1, 1965—Sept. 10, 1965	70.71 \pm 1.70
TF-661	Sept. 20, 1965—Oct. 1, 1965	70.51 \pm 1.87
TF-662	Oct. 1, 1965—Oct. 10, 1965	73.00 \pm 1.80
TF-664	Nov. 1, 1965—Nov. 10, 1965	71.83 \pm 1.76

REFERENCES

Date lists:

- Tata Institute IV Agrawal and Kusumgar, 1966
Tata Institute V Agrawal and Kusumgar, 1968
Agrawal, D. P., Kusumgar, S., and Lal, D., 1965, The measurement of C^{14} activity and some age determinations of archaeological samples: *Current Sci.*, v. 34, p. 394-397.
Agrawal, D. P. and Kusumgar, Sheela, 1966, Tata Institute radiocarbon date list IV: *Radiocarbon*, v. 8, p. 442-452.
_____ 1968, Tata Institute radiocarbon date list V: *Radiocarbon*, v. 10, no. 1, p. 131-143.
Ghosh, A., 1961-1966, *Indian Archaeology—a Review: Archaeol. Survey of India.*