

On re-heating alloys, quenched to room temperature and aged at that temperature to produce zones, to temperatures in the range of 170–220° C., some of the zones get dissolved in accordance with the low-temperature miscibility loop. The remaining zones grow further and are able to nucleate the transition phase in accordance with the high-temperature miscibility loop. The expected shift in equilibrium also occurs on reverting the alloys at temperatures above the lower miscibility loop, i.e., at temperatures above 220° C. However, the question still remains open whether at these high temperatures dissolution of all the zones takes place or the larger zones transform to the rhombohedral phase. Further, there is no certainty about the mode of precipitation of zinc in these concentrated alloys on reversion above 170° C. It may form sequentially as suggested by some earlier investigators^{10,12-14} and/or by discontinuous and continuous precipitation at grain boundaries and lattice defects.

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RADIOCARBON DATES OF SOME CHALCOLITHIC SAMPLES

D. P. AGRAWAL AND SHEELA KUSUMGAR

Tata Institute of Fundamental Research, Colaba, Bombay-5

ABSTRACT

Radiocarbon dates, given here, were measured by counting methane in gas proportional counters. The C¹⁴ dates place the beginning of the Black-and-red Ware of Chirand (Bihar) to 8th-9th century B.C., the West Bengal Black-and-red Ware being still earlier. Kayatha Culture has been dated to ca. 1900 B.C.

RADIOCARBON dates of some samples from the excavated Chalcolithic sites of Chirand, Eran, Mahisdal, Kayatha and Sonagaon, are presented in this report.

The samples were given the usual pretreatment, wherever possible, for the removal of extraneous carbonates and humic acid. Visible rootlets were picked manually. The samples were counted in the form of methane in gas proportional counters. For modern reference standard 95% activity of the N.B.S. oxalic acid was used. Detailed procedures have been described by us in earlier papers (Kusumgar *et al.* 1963; Agrawal *et al.*, 1965).

All dates given below are in years B.P. To convert them to A.D./B.C. scale, 1950 should be used as the reference year. Each sample has two dates: the first one is based on the half-life value of 5568 ± 30 yrs.; the second date, given within brackets, on 5730 ± 40 yrs. For all intercomparison dates based on the same half-life value should be used.

GENERAL COMMENT ON DATES*

From Chirand, the date TF-444, 2665 ± 105 , presented here, is in the series of TF-334, 2795 ± 125 and TF-336, 2715 ± 100 (Agrawal *et al.*, 1966)—all internally consistent within one standard deviation. These dates place the beginning of Black-and-red ware in Chirand to 8th-9th century B.C. The Black-and-red ware of Bengal antedates that of Bihar, as indicated by Mahisdal dates TF-390, -391 and -392, given below. TF-445 from Chirand is a wood sample from a natural pit from which a large number of microliths, unassociated with any ware, were reported and hence this date should not be used to date the Black-and-red ware of Chirand.

The C¹⁴ dates from the earlier excavations from Kayatha had shown some scatter. Therefore more samples were collected under

* For discussions the dates based on the half-life value of 5730 yrs. have been used.

more controlled conditions in the subsequent excavations conducted by the Deccan College, Poona. These show a fair internal consistency and place the beginning of the Kayatha Culture to ca. 1900 B.C.

¹⁴C DATES WITH SAMPLE DESCRIPTIONS

Chirand, Bihar, India

Chirand (Lat. 25° 45' N., Long. 84° 45' E.), District Saran, is a protohistoric site being excavated by Dr. B. S. Verma. The samples were submitted by the Director of Archaeology, Patna.

TF-445, Natural Pit
3500 ± 100 (3600 ± 100)

Wood from Trench CRD-X, Locus A 2, pit sealed by layer 11, Depth 8.2 m. NaOH pretreatment was also given. Comment: The sample is from a pit in natural soil which yields large number of microliths which is sealed by Black-and-red Ware deposits.

TF-444, Black-and-red Ware Deposits,
2590 ± 105 (2665 ± 105)

Charred wood from Trench CRD-VII, Locus A 2, Layer 16, Depth 10.5 m. NaOH pretreatment was also given.

Eran, Madhya Pradesh, India

Eran (Lat. 24° 5' 16" N., Long 78° 10' 24" E.), District Sagar, was excavated by Prof. K. D. Bajpai, Department of Archaeology, University of Sagar, who submitted the samples.

TF-330, Period I, 3220 ± 100
(3315 ± 100)

Charcoal from ERN 7, Locus IV'-IX', Layer 20, Depth 7.7 m. Sample No. ERN 7/C/6263/7.

TF-327, Period I, 3280 ± 100
(3375 ± 105)

Charcoal from ERN 7, Locus VI'-IX', Layer 17, Depth 6.8 m. Sample No. ERN 7/C/62-63/4.

TF-329, Period I, 3300 ± 105
(3395 ± 110)

Charcoal from ERN 7, Locus VI'-IX', Layer 19, Depth 7.5 m., Sample No. ERN 7/C/62-63/6.

TF-331, Period I, 3355 ± 90
(3450 ± 95)

Charcoal from ERN 7, Locus IV'-IX', Layer 21, Depth 8.0 m., Sample No. ERN 7/C/62-63/8.

Mahisdal, West Bengal, India

Mahisdal (Lat. 23° 42' 45" N., Long. 87° 41' 33" E.), District Birbhum, was excavated by Shri R. P. Das and the samples were submitted by the Director-General of Archaeological Survey of India, New Delhi-11.

TF-390, Chalcolithic Culture, 2725 ± 100
(2805 ± 100)

Charred rice from Trench MDL-1, Locus

I-II, Layer 4, Depth 1.45 m., Field No. MDL-1/C/64-2. NaOH pretreatment was also given. Comment: From late phase.

TF-392, Chalcolithic Culture, 2950 ± 105
(3035 ± 110)

Charcoal from Trench MDL-1, Locus IV-VI, Layer 5, Depth 1.30 m., Field No. MDL-1/C/64-4. Visible rootlets were removed. NaOH pretreatment was also given.

TF-391, Chalcolithic Culture, 3235 ± 105
(3330 ± 105)

Charcoal from Trench MDL-1, Locus VII-VIII, Pit 3 sealed by Layer 5, Depth 1.61 m., Field No. MDL-1/C/64-3.

Kayatha, Madhya Pradesh, India

Kayatha (Lat. 23° 30' N., Long. 76° E.), District Ujjain, the site was excavated by Dr. H. D. Sankalia, Deccan College, Poona-6, who submitted the samples. The samples marked with an asterisk have been submitted by Shri V. S. Wakankar, Vikram University, Ujjain, who had excavated the site earlier.

TF-776, Chalcolithic Culture, 3455 ± 110
(3555 ± 115)

Charcoal from Trench A, Layer 4, Depth not given, Field No. 111. NaOH pretreatment was also given.

TF-777, Chalcolithic Culture, 3625 ± 95
(3730 ± 100)

Charcoal from Trench A, Layer 5, depth not given, Field No. 361. NaOH pretreatment was also given.

TF-778, Chalcolithic Culture, 3550 ± 95
(3655 ± 95)

Charcoal from Trench A, Layer 6, Depth not given, Field No. 599. NaOH pretreatment was also given.

TF-779, Chalcolithic Culture, 3685 ± 105
(3790 ± 110)

Charcoal from Trench A, Layer 7, Depth not given, Field No. 693.

TF-780, Chalcolithic Culture, 3680 ± 95
(3785 ± 100)

Charcoal from Trench A, Layer 8, Depth not given, Field No. 697.

TF-781, Chalcolithic Culture, 3720 ± 105
(3830 ± 105)

Charcoal from Trench A, Layer 9, Depth not given, Field No. 976. NaOH pretreatment was also given.

TF-396*, Chalcolithic Culture, 3575 ± 105
(3680 ± 110)

Charcoal from KTH-1, Layer 32, Depth 7.80 m., Field No. 5, NaOH pretreatment was also given.

TF-397*, Chalcolithic Culture, 3350 ± 100
(3450 ± 100)

Charcoal from KTH-1, Layer 33, Depth 8 m., Field No. 7. NaOH pretreatment was also given.

TF-399*, Chalcolithic Culture, 3525 ± 100
(3625 ± 100)

Charcoal from KTH-1, Layer 37, Depth 9.1 m., Field No. 8. NaOH pretreatment was also given.

TF-400*, Chalcolithic Culture, 3800 ± 105
(3915 ± 110)

Charcoal from KTH-1, Layer 38, Depth 9.60 m., Field No. 9. NaOH pretreatment was also given.

TF-401*, Chalcolithic Culture, 3190 ± 105
(3285 ± 105)

Charcoal from KTH-1, Layer 39, Depth 10 m., Field No. 10. NaOH pretreatment was also given. Comment: Date is younger than expected.

TF-402*, Chalcolithic Culture, 3240 ± 100
(3330 ± 100)

Charred wheat from KTH-1, Layer 35, Depth not given, Field No. 11. NaOH pretreatment was also given. Comment: Date is younger than expected.

TF-405*, Chalcolithic Culture, 3320 ± 100
(3415 ± 100)

Charcoal from KTH-2, Layer 10, Depth 3.5 m., Field No. 14. NaOH pretreatment was also given.

TF-680*, Chalcolithic Culture, 3850 ± 95
(3965 ± 100)

Charcoal from Trench KTH-3, Layer 13, Depth not given, Field No. 21.

TF-678*, Chalcolithic Culture, 3530 ± 100
(3635 ± 100)

Charcoal from Trench KTH-4, Layer 18, Depth not given, Field No. 19.

TF-676*, Chalcolithic Culture, 3160 ± 105
(3255 ± 105)

Burnt wheat grains from Trench KTH-4, Layer 14, Depth not given, Field No. 17. NaOH pretreatment was also given.

TF-679*, Chalcolithic Culture, 3155 ± 130
(3250 ± 135)

Charcoal from Trench KTH-3, Layer 9, Depth not given, Field No. 20.

Sonegaon, Maharashtra, India

Sonegaon (Lat. $18^{\circ} 39' N.$, Long. $74^{\circ} 5' E.$), District Poona, the site is being excavated by Dr. H. D. Sankalia, who submitted the samples. The site is culturally akin to Jorwe and Nevasa.

TF-379, Jorwe Culture, 3150 ± 90
(3240 ± 95)

Charred grain from Mound II, Layer 2b, Depth 1.2 m., Field No. 69. Visible rootlets removed.

TF-383, Jorwe Culture, 3185 ± 100
(3280 ± 100)

Charcoal from corner of baulk-cutting, Field No. 303. NaOH pretreatment was also given.

TF-380, Jorwe Culture, 3230 ± 105
(3325 ± 110)

Charcoal from Mound II, Layer 4, Depth 1.8 m., Field No. 120. Visible rootlets removed. NaOH pretreatment was given.

TF-382, Jorwe Culture, 3195 ± 100
(3290 ± 100)

Charred wheat from Mound II, Layer 5, Depth 2.2 m., Field No. 136.

TF-384, Jorwe Culture, 3415 ± 105
(3515 ± 110)

Charcoal from Mound II, Layer 7, Depth 4.2 m., Field No. 321. Visible rootlets were hand-picked. NaOH pretreatment was also given.

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MORPHOGENESIS OF EMBRYO IN A PARASITIC ANGIOSPERM *EXOCARPUS CUPRESSIFORMIS*

S. S. BHOJWANI

Department of Botany, University of Delhi, Delhi-7

OF late, the technique of *in vitro* culture has been profitably employed for studying seed germination and embryo morphogenesis in parasitic angiosperms. Unlike stem-parasites,

root-parasites fail to germinate on simple nutrient media.¹⁻³ In some species of root-parasites, shoot morphogenesis has been demonstrated to be host-dependent.^{4,5}