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## RADIOCARBON DATES OF SAMPLES FROM HISTORICAL LEVELS

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IN this paper we present radiocarbon "dates" of samples from a few historical sites—the important ones among them being Ahichchhatra, Besnagar, Dharnikota and Nagara. The experimental procedures are described briefly below; details have been described earlier (Kusumgar *et al.*, 1963; Agrawal *et al.*, 1965).

Samples were first cleaned manually to remove extraneous matter (rootlets, earth, etc.). Carbonates, if present, were removed by digesting samples in 1% HCl. Any humic acid present was removed by treating the samples with NaOH. In the case of samples composed of soft material, this step was avoided, lest they disintegrate. Samples were counted in the form of CH<sub>4</sub> in gas proportional counters. Ninety-five per cent activity of N.B.S. oxalic acid is used as modern reference "standard".

Each sample is accompanied by two dates in years B.P.: the first is based on the C<sup>14</sup> half-life value of 5568 ± 30 yrs.; the second, within parenthesis, on 5730 ± 40 yrs. The latter may be used as the best working value (Godwin, 1962). The same half-life should be used for all intercomparisons. A.D. 1950 should be used

as reference year for conversion of B.P. dates to A.D./B.C. scale.

### GENERAL COMMENT ON DATES

C<sup>14</sup> dates for the fortifications of Ahichchhatra and Dharnikota (this date list) and Rajgir (TF-46 and TF-45) show that earliest historical fortifications do not seem to go beyond 2nd-3rd century B.C. Bainapalli sample TF-530 may indicate that the end of the southern megaliths goes to 3rd-4th century B.C. More dates for the megaliths of the south are needed to determine their time-spread. An "Asura" culture site has been dated, for the first time, to the beginning of Christian era.

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### C<sup>14</sup> DATES WITH SAMPLE DESCRIPTIONS

#### Ahichchhatra, Uttar Pradesh, India

Ahichchhatra (Lat. 28° 22' N., Long. 79° 7' E.), District Bareilly, was the capital of north

Panchal. The site has been excavated by Dr. N. R. Banerji. Samples were submitted by Shri A. Ghosh, Archaeological Survey of India.

TF-301, Defences,  $2255 \pm 105$   
( $2320 \pm 105$ )

Charcoal from Locus CXIII-CXIV, Layer 1, Depth 0.8 m., Field No. 2 (Defences). Visible rootlets were handpicked. NaOH pretreatment was given. Comment: the sample was found in the debris just above the mud-filling belonging to phase II of the early historic Defences.

TF-317, Late P.G. Ware Deposits(?),  $2155 \pm 100$   
( $2220 \pm 105$ )

Charcoal from high mound, Locus X-XI, Layer 15, Depth 3.4 m., Field No. 214 (H.M.). Comment: sample belongs to disturbed strata.

#### **Baghaikhor, Uttar Pradesh, India**

TF-187, Rock Shelters,  $270 \pm 120$   
( $280 \pm 125$ )

Charcoal from Baghaikhor, District Mirzapur, Trench BGK-Tr, 2, Locus 2-3, Pit A, sealed by Layer 1, Depth 0.1 m., Field No. BGK(M)-63/3001. NaOH pretreatment was given. Sample submitted by Prof. G. R. Sharma. Comment (G. R. S.): as these shelters have been used to light fires by shepherds till modern times, later intrusions cannot be ruled out. This charcoal is obviously of much later time.

#### **Bainapally, Madras, India**

TF-350, Post-megalithic Period,  $2265 \pm 100$   
( $2330 \pm 105$ )

Charred grain from Bainapally (Lat.  $12^{\circ} 33' N.$ , Long.  $78^{\circ} 27' E.$ ), District North Arcot, Trench BNP-1, Locus C<sub>1</sub>, Pit 4, sealed by Layer 3, Depth 1.30 m., Field No. BNP1/C<sub>1</sub>/64.2. Submitted by Shri A. Ghosh. Visible rootlets were handpicked.

#### **Besnagar, Madhya Pradesh, India**

TF-387, N.B.P. Ware Deposits,  $2350 \pm 100$   
( $2420 \pm 105$ )

Charcoal from Besnagar (Lat.  $23^{\circ} 32' N.$ , Long.  $77^{\circ} 48' E.$ ), District Vidisha, BSN-4, Locus G/I, Layer 8, Depth 3.00 to 3.15 m., Field No. 1850. Submitted by Shri A. Ghosh.

#### **Bhaja, Maharashtra, India**

TF-245, Buddhist Rock-Excavations,  $75 \pm 90$   
( $75 \pm 90$ )

Wood from Bhaja Rock-Excavations (Lat.  $18^{\circ} 44' N.$ , Long.  $73^{\circ} 29' E.$ ), District Poona, Field No. AR-11. Submitted by Shri A. Ghosh. Comment: the sample appears to be derived from a recent repair.

#### **Dharnikota, Andhra Pradesh, India**

Dharnikota (Lat.  $16^{\circ} 34' 45'' N.$ , Long.  $80^{\circ} 24' 21'' E.$ ), District Guntur, is an early historic site near Amravati. Excavations were conducted by Shri Venkataramayya and samples submitted by Shri A. Ghosh.

TF-248, Fortifications,  $2095 \pm 100$   
( $2155 \pm 100$ )

Charcoal from Trench DKT-1, Locus XXXVI-XXXIX, Layer 10, Depth 6 m., Field No. DKT-1/63/No. III. Comment: sample will date the Satavahana fortifications.

TF-247, Early Historic Period,  $2275 \pm 100$   
( $2340 \pm 100$ )

Charcoal from Trench DKT-2, Locus A<sub>2</sub>-A<sub>3</sub>, Layer 8, Depth 3.7 m., Field No. DKT-2 (63) No. I. NaOH pretreatment was also given.

#### **Karla, Maharashtra, India**

TF-185, Buddhist Rock-Excavation,  $2180 \pm 95$   
( $2245 \pm 95$ )

Wood rib from Karla (Lat.  $18^{\circ} 45' N.$ , Long.  $73^{\circ} 29' E.$ ), District Poona, Chaitya Cave No. 8. NaOH pretreatment was also given. Sample submitted by Shri A. Ghosh.

#### **Mainahai, Uttar Pradesh, India**

TF-347, Historical Levels,  $1420 \pm 95$   
( $1460 \pm 95$ )

Charcoal from Mainahai (Lat.  $25^{\circ} 21' N.$ , Long.  $81^{\circ} 25' E.$ ), District Allahabad, Trench MNH/BWN-1, Locus 0-3, Layer 6 N, Depth 0.75 m., Field No. MNH/64/901. NaOH pretreatment was also given. Sample submitted by Prof. G. R. Sharma. Comment: the sample will date historical sculptures discovered at the site.

#### **Morahana Pahar, Uttar Pradesh, India**

TF-188, Rock-shelter Deposits,  $1530 \pm 95$   
( $1575 \pm 100$ )

Charcoal from Morahana Pahar, District Mirzapur, Trench MRA, Locus 1-2, Pit A, sealed by Layer 1, Depth 0.09 m., Field No. MRA(M)-63/3002. NaOH pretreatment was given. Sample was submitted by Prof. G. R. Sharma. Comment (G. R. S.): as these shelters have been used by shepherds till modern times to light fires, later intrusions cannot be ruled out.

#### **Nagara, Gujarat, India**

Nagara (Lat.  $22^{\circ} 41' 15'' N.$ , Long.  $72^{\circ} 38' 31'' E.$ ), District Kaira, is a historical site. It is being excavated by Dr. R. N. Mehta, M. S. University,

Baroda, who submitted the samples. Comment: C<sup>14</sup> dates agree with the excavator's archaeological estimates.

TF-362, Period III, 1945 ± 90

(2000 ± 90)

Charcoal from Trench NGR-II, Locus III, Layer 13, Depth 3.30 m., Field No. 1947. NaOH pretreatment was also given.

TF-364, Period III, 2030 ± 100

2085 ± 105

Charcoal from Trench NGR-II, Locus III, Layer 16, Depth 4.40 m., Field No. 1949.

Saradkel, Bihar, India

TF-369, Asura Culture, 1910 ± 90

(1970 ± 90)

Charcoal from Saradkel (Lat. 23° 3' 30" N., Long. 85° 21' E.), District Ranchi, Trench SDK-2, Locus C<sub>3</sub>-C<sub>4</sub>, Layer 3, Depth 0.01 m. (?), Field No. SDK-2/65-114. NaOH pretreatment was given. Sample submitted by Shri A. Ghosh. Comment: red ware sprinklers are associated with these deposits.

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## A NEW FORM OF *ORYZA* FROM CHINA

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FOR tracing evolution and relationship in the genus *Oryza* a large collection of species and varieties are maintained in the Central Rice Research Institute. In this collection, variations amongst *Oryza officinalis* Wall. from different localities in Asia are interesting. There is evidence of sub-species formation in this species as shown by morphological differences as well as hybrid sterility. For instance Morinaga and Kuriyama (cited by Kihara<sup>1</sup>) found complete seed sterility in intervarietal hybrids of *O. officinalis* in six cross combinations. Another instance is a Ceylon collection which has been inferred by Karibasappa<sup>2</sup> to be classifiable as *O. officinalis* on morphological and cytological characters while Sharma and Shastry<sup>3</sup> designate it as a distinct species.

One collection of seeds labelled as *O. officinalis* No. W. 0553 was secured from National Institute of Genetics, Misima, as being collected from China. Previously a sample from this collection had shown some distinctive characters and therefore this was secured again, grown, and the novelty was confirmed.

The plants resemble varieties of *O. officinalis* in general appearance, in the presence of short woody rhizomes, in panicle branching and also in the appearance of spikelets. The spikelets have the size, shape and lemma sculpturing characteristic of the section *Latifoliae* of the genus. The resemblances are shown in Fig. 1 where seeds of four species in this section are arranged on either side of the new species

and it can be seen that it resembles the seeds of *O. latifolia*.

The important difference between this Chinese form and *O. officinalis* is in its chromosome number. Smears of P.M.C. showed it to be a tetraploid, 24 bivalents being present in all the cells, while all examined varieties of *O. officinalis* are diploids (N=12). The ligules of well-grown leaves in this collection show moderate fringing (hairs) and this feature is generally absent in *O. officinalis*, while this fringing is conspicuous in *O. latifolia* and related American species. This feature in the Chinese form is compared with Asian *O. officinalis* and American *O. latifolia* in Fig. 2.

It is possible that the form under study had evolved in China by hybridisation between two sub-species of *O. officinalis*, accompanied by chromosome doubling. A parallel instance is known from India. A tetraploid species closely resembling *O. officinalis* has been collected from Malampuzha in Kerala, and Gopalakrishnan<sup>4</sup> has elucidated its relationships.

Since this form closely resembles *O. latifolia* of America in chromosome number, ligule fringing, tall growth (190 cm.), broad leaves (3.2 cm.), as well as in well-developed auricles, an alternative explanation must be considered. It is unlikely, but by accident seeds of *O. latifolia* could have contaminated the culture of this sample in green house in Japan, and had been propagated. A direct check is not possible since the locality from which it was collected is not known, and could be in Mainland China.