RADIOCARBON DATES OF SOME QUATERNARY SAMPLES

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ABSTRACT

The C^{14} dates presented here date various eustatic levels of the late Quaternary period in India. Some of the complete regional pollen sequences too have been dated for the first time.

THE problems of the Quaternary period in India are being tackled by various institutions from various angles. These attempts will eventually lead to a palæo-climatological and ecological reconstruction of the Quaternary period, as also to the dating of various Stone Age industries and the eustatic changes.

Presented below are the C^{14} dates of some such Quaternary samples. The dates given are in years B.P. based on 5568 ± 30 yrs. half-life value; those given in parenthesis are on the basis 5730 ± 40 yrs. For modern reference standard, N.B.S. oxalic acid is used. For converting the dates to A.D./B.C. scale, 1950 has been used as the base year. The techniques used have been described elsewhere (Agrawal *et al.*, 1965).

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C^{14} DATES WITH SAMPLE DESCRIPTIONS

Continental Shelf, West Coast, India

These samples were collected by dredging on the continental shelf by R. R. Nair, National Institute of Oceanography, Panaji, Goa.

TF-983, Late Quaternary, 8880 ± 125
(9135 ± 130)

Shells from the continental shelf off Karwar (Lat. 10° 33′ N., Long. 73° 43′ E.). Water depth 58·5 m., Sample No. 653.

TF-969, Late Quaternary, 140 ± 90
(145 ± 95)

Coral from the continental shelf off Bombay (Lat. 18° 36′ N., Long. 70° 39′ E.). Pure Aragonite. Water depth 96 m., Sample No. 42 b.

General comment : The ages seem to be lower than expected.

Coondapoor, Mysore, India

TF-814, Quaternary, > 40000
(> 45000)

Submerged mangrove (?) plants from Coondapoor (Lat. 13° 45′ N., Long. 74° 45′ E.). District South Kanara, Depth 6·12 to 9·2 m. Sample was submitted by Shri K. S. Karanth, Puttur, S. Kanara.

Kakathope Madras, India

Kakathope (Lat. 11° 35′ N., Long. 76° 52′ E.), District Nilgiris. Samples collected by H. P. Gupta, Birbal Sahni Institute of Palæobotany, Lucknow. NaOH pretreatment was given to both the samples.

TF-695, Late Quaternary, 14980 $^{+355}_{-340}$

$\left(15415\ ^{+365}_{-350}\right)$

Organic mud, Depth. 2·0–2·3 m., Field No. 4789/3. Sample No. 1.

TF-696, Late Quaternary, 23590 $^{+740}_{-675}$

$\left(24275\ ^{+760}_{-695}\right)$

Organic mud, Depth 3·2 to 3·5 m., Field No. 4789/3, Sample No. 2.

General comment : The material was recovered by borings to date the pollen zones.

Little Rann of Kutch Gujarat, India

TF-807(a), *Late Quaternary, 13640 ± 200*
(14035 ± 205)

Shells from the bore-hole No. 6 at Surajbari (Lat. 23° 8′ N., Long. 70° 42′ E.), District Kutch. The bore-hole was drilled for the construction of railway bridge. Depth 19 m. below M.S.L. Sample is from the top of a bed which is 0·83 m. thick. Field No. 7. Submitted by Y. G .K. Murty, Geological Survey of India, Ahmedabad.

TF-807(b), *Late Quaternary, 15995 ± 250*
(16460 ± 225)

Shells from the bore-hole No. 6 at Surajbari. Depth. 19·85 m. below M.S.L. bottom of the bed; Field No. 7. Submitted by Y. G. K. Murty.

TF-808, Holocene, 575 ± 105
(590 ± 110)

Shells from the creek cutting between the bore-holes 9 and 10 at Surajbari. Shells from depths 1·0 m, and 1·3 m. were mixed. Field

Nos. 10 A and 10 B. Submitted by Y. G. K. Murty.

TF-913, Holocene, 6315 ± 95
(6500 ± 95)

Shells from the walls of a brine well in the Little Rann of Kutch off Kuda (Lat. 23° 13′ N., Long. 71° 23′ E.), District Kutch, Depth. 5·7 m., Location No. 17, Sample No. 1. Submitted by S. K. Gupta, T.I.F.R., Bombay 5.

TF-914, Holocene, 5925 ± 105
(6100 ± 110)

Shells from the walls of a brine well in the Little Rann of Kutch off Kuda, Depth between 7·9 and 8·2 m., Location No. 16, Sample No. 1. Submitted by S. K. Gupta.

TF-915, Holocene, 6640 ± 125
(6835 ± 130)

Shells from the walls of a brine well in the Little Rann of Kutch off Jhinjunvada (Lat. 23° 24′ N., Long. 71° 32′ E.), District Kutch, Depth between 5·1 and 5·5 m., Location No. 13, Sample No. 1. Submitted by S. K. Gupta.

TF-917, Holocene, 6835 ± 110
(7035 ± 110)

Wood from the walls of a brine well in the Little Rann of Kutch off Kharagodha (Lat. 23° Little Rann of Kutch off Kharagodha, Depth between 5·4 and 7·1 m., Location No. 2, Sample No. 1 c. NaOH pretreatment was given. Submitted by S. K. Gupta.

TF-919, Holocene, 5900 ± 105
(6075 ± 110)

Shells from the walls of a brine well in the Little Rann of Kutch off Kharagodha, Depth. between 2·6 and 2·9 m., Location No. 2, Sample No. 1(a). Submitted by S. K. Gupta.

TF-920, Holocene, 6860 ± 110
(7060 ± 115)

Wood from the walls of a brine well in the Little Rann of Kutch off Kharagodha, Depth between 2·4 and 3·5 m., Location No. 1, Sample No. 1. Submitted by S. K. Gupta.

TF-927, Holocene, 4685 ± 100
(4820 ±105)

Shells from the bore-hole No. RH 27(d) in the Little Rann of Kutch at Surajbari (Lat. 23° 08′ N., Long. 70° 42′ E.). District Kutch, Depth 7 m., Sample No. 3, Field No. RH 27 (d)/3. Submitted by S. K. Gupta.

TF-930, Holocene, 3720 ± 100
(3830 ± 105)

Shells from the bore-hole No. RH 27(c) in the Little Rann of Kutch at Surajbari, Depth 4·9 m., Sample No. 3, Field No. RH 27(c)/3. Submitted by S. K. Gupta.

TF-932, Holocene, 6600 ± 105
(6795 ± 110)

Shells from the bore-hole No. RH 24 in the Little Rann of Kutch at Surajbari, Depth 16 m., Sample No. 7, Field No. RH 24/7. Submitted by S. K. Gupta.

General comment: The average height of the plain of the Little Rann of Kutch is 2·4 m. above M.S.L.

Paithan, Maharashtra, India

TF-891, Late Quaternary, 18490 ± 650
(19025 ± 660)

Freshwater shells from Paithan (Lat. 19° 31′ N., Long. 75° 22′ E.), District Aurangabad. The sample derives from a gravel bed of an old flood plain of river Godavari, Depth 5 m. Submitted by A. Parthasarathy, Indian Institute of Technology, Powai, Bombay.

Sambhar Lake, Rajasthan, India

Sambhar salt lake (Lat. 26° 54′ N., Long. 75° 13′ E.), District Jaipur. The samples were collected and submitted by Gurdip Singh, Birbal Sahni Institute of Palæobotany, Lucknow, for dating the pollen zones. NaOH pretreatment was given to all the samples.

TF-698, Late Quaternary, 8585 ± 140
(8835 ± 140)

Organic debris, Depth 3·27 to 3·35 m., Field No. S-2/327–335, Sample No. RC-2.

TF-738, Late Quaternary, 8065 ± 135
(8300 ± 135)

Organic debris, Depth 2·70 to 2·85 m., Field No. S-2/270–285, Sample No. RC-3.

TF-739, Late Quaternary, 4535 ± 110
(4665 ± 115)

Organic debris, Depth. 1·50 to 1·60 m., Field No. S-2/150–160, Sample No. RC-4.

TF-883, Late Quaternary, 4385 ± 110
(4510 ± 110)

Organic debris, Depth 1·35 to 1·50 m., Field No. S-2/135–150. Sample No. RC-6.

TF-884, Late Quaternary, 6060 ± 310
(6235 ± 315)

Organic debris, Depth 1·85 to 1·95 m., Field No. S-2/185–195. Sample No. RC-7.

Comment: Errors are large as Anthracite was mixed because of the inadequacy of the sample weight.

TF-887, Late Quaternary, 8990 ± 125
(9250 ± 130)

Organic debris, Depth 3·15 to 3·25 m., Field No. S-2/315–325, Sample No, RC-10.

General comment: Samples were obtained from a profile exposed by digging a pit in the bed of the salt lake. The samples in the form of 6" cubes of sediment were carved out at regular intervals. The samples were composed of organic debris, mainly in the form of tiny carbonised wood fragments, and were isolated from the bulk samples of silty clay by means of differential sedimentation and treatment with HCl and HF.

Sankrail, West Bengal, India

Sankrail (Lat. 22° 35′ N., Long. 88° 20′ E.), District Howrah. Samples collected and submitted by Vishnu Mittre and H. P. Gupta.

TF-850, Late Quaternary, 2540 ± 100
(2615 ± 100)

Peaty clay, Depth 1·4 m., Sample No. 1.

TF-851, Late Quaternary, 3960 ± 95
(4075 ± 100)

Peat, Depth 1·8 m., Sample No. 2.

TF-853, Late Quaternary, 4785 ± 105
(4925 ± 110)

Wood, Depth 1·5 m., Sample No. 4, NaOH pretreatment was given.

TF-855, Late Quaternary, 4590 ± 130
(4720 ± 135)

Peat, Depth 3 m., Sample No. 6.

TF-856, Late Quaternary, 5645 ± 105
(5810 ± 110)

Peat, Depth 6 m., Sample No. 7.

TF-857, Late Quaternary, 5285 ± 110
(5440 ± 115)

Wood, Depth not given, Sample No. 8.

General comment: Samples were collected from an already exposed and uncovered trench which was frequently flooded by Hoogli river.

Saurashtra Coast, Gujarat, India

TF-902, Late Quaternary, 35050 $^{+5390}_{-3200}$

$\left(36070\ ^{+5550}_{-3290}\right)$

Shells from a raised beach near Porbander Villa (Lat. 28° 38′ N., Long. 69° 36′ N.), District Junagadh. Location No. 33, 3·5 m., height above High Water Level (H.W.L.), Sample No. 1. Submitted by S. K. Gupta.

TF-903, Late Quaternary, 27710 $^{+1400}_{-1190}$

$\left(28515\ ^{+1440}_{-1225}\right)$

Coral from an emerged reef at Visawara village (Lat. 21° 45′ N., Long. 69° 26′ E.), District Junagadh. Location No. 34, 4·3 m., height above H.W.L., Sample No. 1. Submitted by S. K. Gupta.

TF-905(A), Late Quaternary, 14565 ± 185
(14990 ± 190)

Pieces of corals from a raised reef deposit at Bardia village (Lat. 22° 11′ N, Long. 69° 02′ E.), District Jamnagar. Location No. 29, 4·7 m., height above H.W.L., Sample No. 1(*a*). Submitted by S. K. Gupta.

Comment: Sample contains about 10% calcite.

TF-906, Late Quaternary, > 39000
(> 45000)

Coral from an emerged reef near Okha railway station (Lat. 22° 28′ N., Long. 69° 36′ E.), District Jamnagar, Location No. 27, 0·8 m. below M.S.L., Sample No. 1. Submitted by S. K. Gupta.

TF-907, Late Quaternary, 27050 $^{+1300}_{-1100}$

$\left(27840\ ^{+1340}_{-1210}\right)$

Coral from an emerged reef near the village of Arama (Lat. 22° 26′ N., Long. 69° 05′ E.), District Jamnagar, Location No. 24, 3·5 m. above H.W.L., Sample No. 1. Submitted by S. K. Gupta.

TF-908, Late Quaternary, 5275 ± 105
(5430 ± 110)

Shells from a raised beach deposit near Bhimrana village (Lat. 22° 23′ N., Long. 69° 02′ E.), District Jamnagar, Location No. 23, 1 m. above H.W.L., Sample No. 1: Submitted by S. K. Gupta.

TF-911, Late Quaternary, 5075 ± 105
(5220 ± 105)

Coral from an emerged reef (only during low tide) near the port Salaya (Lat. 22° 22′ N., Long. 69° 39′ E.), District Jamnagar, Location No. 20, Sample No. 1. Submitted by S. K. Gupta.

TF-1014, Late Quaternary, 6010 ± 110
(6185 ± 115)

Coral from an emerged reef Okha (Lat. 22° 28′ N., Long. 69° 36′ E.), District Jamnagar. Field No. C.R. 1·2 m. above H.W.L., Sample No. 1. Submitted by M. V. A. Sastry, Geological Survey of India, Calcutta.

TF-1015, Late Quaternary, 4445 ± 105
(4575 ± 105)

Coral from an emerged reef on Dwarka Okha Road, District Jamnagar, Field No. C.R. 2.

1·6 m. above H.W.L., Sample No. 1. Submitted by M. V. A. Sastry.

Willington, Kerala, India

TF-965, Post-Glacial, 8080 ± 120
(8315 ± 125)

Root of a tree from Willington Island (Lat. 9° 58′ N., Long. 76° 15′ E.), District Cochin, Depth 16·75 m., Sample No. 1, Field No. 1, NaOH pretreatment was given. Submitted by Ev. Nielson, K.R.E.C., Surathkal.

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INCREASED ACCESSIBILITY OF SUBSTRATES TO ENZYMES IN STRAWBERRY LEAVES FED WITH IODOACETATE

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ABSTRACT

Administration of (^{14}C) glucose to strawberry leaves either in water or in iodoacetate led to the generation of ^{14}C-labelled acids whose activities in the inner spaces of leaf cells and in the soaked-out inner space solutions were determined.

The magnitude of leakage of acids was higher in iodoacetate than in water and this was considered as a further evidence to support the previously suggested concept of increased accessibility, in the metabolic region, of substrate to enzymes.

INTRODUCTION

IN strawberry leaves and radish root slices, low concentrations of iodoacetate increased the CO_2 output and induced characteristic changes in the metabolite content and in the leakage of certain metabolites from the tissues (Barker and Younis, 1965 *a*, *b* ; Younis *et al.*, 1969).

Younis (1969) fed strawberry leaves with (^{14}C)-glucose either in water or in iodoacetate. The latter considerably increased the $^{14}CO_2$ output and the permeability of the plasmalemma and the tonoplast as was evident from the increased leakage from the free and inner spaces of leaves. The rate of leakage of sugars was dependent on their content in the inner space and was much higher in iodoacetate than in water.

The above-mentioned pronounced changes in cell permeability and metabolism led to the conclusion that iodoacetate increased the accessibility, in the metabolic region, of substrates to enzymes normally not saturated with their substrates and so the increased respiration could be explained on this basis.

It is the main objective of this paper to consider further results, which have been obtained during the work presented in a previous paper (Younis, 1969). The present results provide a further evidence for the concept of increased accessibility of substrates to enzymes in presence of iodoacetate.

MATERIALS AND METHODS

The methods of sampling and of feeding the strawberry leaves (var. Huxley) were precisely those of Barker and Younis (1965 b) and Younis (1969). A preliminary period of 2 days with the ends of petioles in water was allowed before feeding the leaves with (^{14}C)-glucose either in water or in 10^{-3} M iodoacetate. Samples were taken for analysis after 24 and 48 hours.

The determination of leakage was exactly as in Younis (1969). Briefly, in the two experiments carried out at 15° C, the leaves were cut into strips, dropped in water and subjected to two successive 5 mins. evacuations to ensure injection of water into the intercellular spaces. The strips were then soaked in a fresh aliquot of water for 2 hours under aerobic conditions: this allowed compounds to diffuse out.

The strips, after being soaked, were taken out, blotted and divided into 2 portions; one was extracted for keto-acids and the other for

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