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Determination of 14C By Accelarator Mass Spectrometry of The Ground Water Sample of Dumka A Hilly Region of Jharkhand, India And Comparison With Ground Water Samples of Different Region With Same Depth.

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***Abstract**: Ground water sample of Dumka was sent to Beta Analytic Inc.,Miami,Florida,USA for determination of radiocarbon age of the sample. The age determined is around 3340 B.P. Its age and pMC value have been compared in this study with the other ground water samples with regional variations.*

I. Introduction

The radioactive decay of14C can be used for age determination of organic or biogenic samples.14C is a naturally occurring radioisotope of carbon having a half life of approximately 5570 years. As 14C decays its emits a weak beta particle which has the energy around 160 KeV. The decay can be shown by the equation-

$^{14}C_6 = {}^{14}N_7 + {}^{0}e_{-1}$ or Beta particle.

The decay of beta particles is constant but spontaneous .Statistical methods are used to analyse the counting data because the probability of decay for an atom of ^{14}C in a discrete sample is constant(Bera.S.K.,&Sinha.R.R.,2015)

The accelerator Mass Spectrometry for determination of ^{14}C was first applied in 1977.This method has enhanced sensitivity from decay counting techniques and counting time is highly reduced and also the sample size is also required in mg level.

The ground water age is the amount of time elapsed between the recharge to the time sample has been taken .The conventional radio active age (B.P) is calculated using the radioactive decay equation

$$t = -8033 \ln (A_{sn}/A_{on}).$$

Where -8033 represent mean life time of ^{14}C .(Stuives & Polach,1977)

A_{on} is the activity in counts per minute of the modern standard.

A_{sn} is the equivalent counts per minute for the sample. If the reservoir corrected conventional radiocarbon age calculated is within the past 200 years ,it is termed as Modern (Stuiver & Polach 1977;362).If the sample age falls after 1950,it is termed greater than Modern. Absolute % M or pMC-(percent modern carbon) is calculated by the formula.

$$\%M = 100 x A_{sn}/A_{abs}$$
$$= 100 x A_{sn}/A_{on}(1/8267(y-1950))\%$$

Where A_{abs}=absolute international standard activity,

Y=year of measurement of the appropriate standard,(Beta Analytic Inc.)

In the present study it has been tried to make the graphical analysis of ^{14}C measurements of ground water samples of various locations of similar depth on the basis of DIC(dissolved inorganic carbon) in different places of India and some other country in different periods with the radiocarbon age of ground water sample of Shiv Pahar,Dumka a hilly region of Dumka district of Jharkhand in India.

II. Methodology

The methodology of the present study includes the result as reported Beta Analytic Inc.,Miami,Florida,USA for the comparision purpose.The sample sent for the ^{14}C analysis from hilly region of Jharkhand provided plenty of carbon for an accurate measurement.The sample was pretreated to extract DIC in the water.For this the method of acidify gas strip was used.Given the complex nature of ground water DIC^{14} chemistry,duplicate measurements within 1-2 pMC was supposed to be reasonable for a single water sample.

As the pMC value come out to be 66.0+/- 0.2 pMC, the apparent radiocarbon age was reported to be 3340 BP.

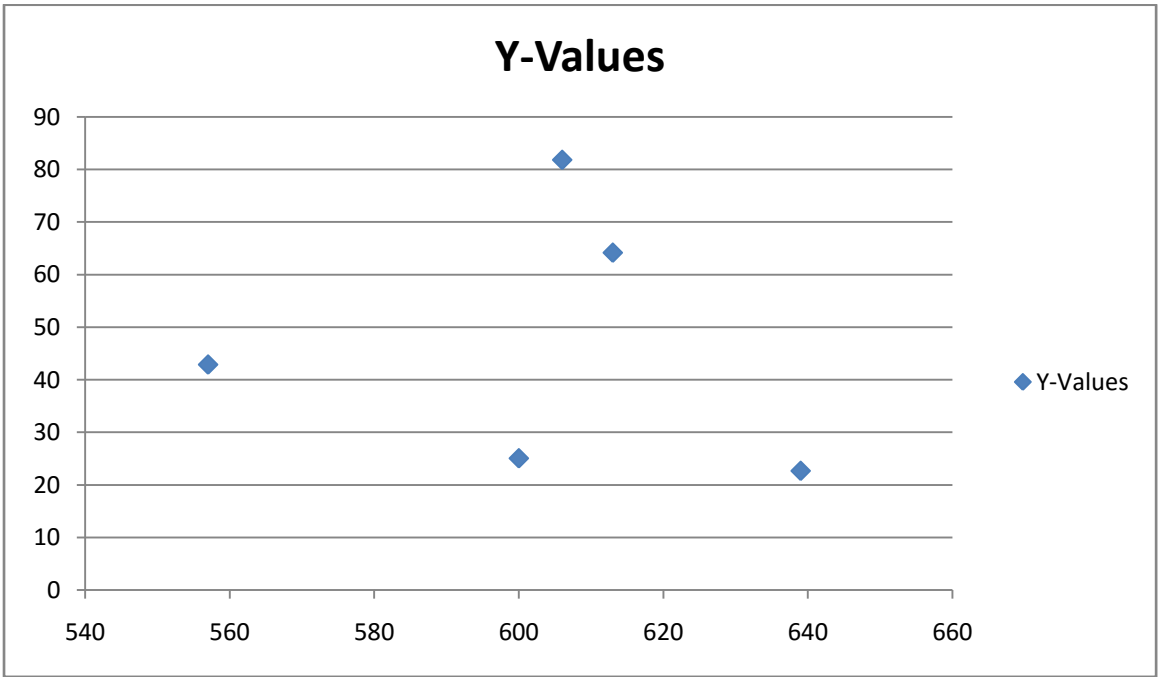
Also for comparative study a graphical study of pMC and radiocarbon age of different regions will be shown in the result of the ground water sample of Dumka a hilly region of Jharkhand.

III. Result &Discussion

As the reported values are calculated relative to NIST SRM-4990B and corrected for isotopic fractionation the pMC value of the ground water sample of Dumka was found to be 66.0+/_0.2 pMC And the apparent radiocarbon age has been reported as-3340 BP.

Table--1

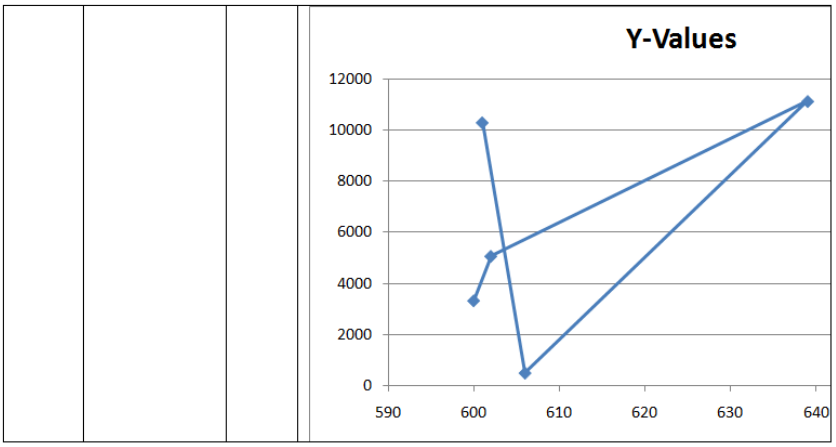
Sample Name	Place	Depth(in ft.)	pMC
KHOP5[a]	South East Bangladesh	601	25.06±0.26
CGO5D	South East Bangladesh	606	81.8±0.61
LCO6D	South East Bangladesh	639	22.67±0.25
TF-841	Mehsana,Gujarat	613	64.15±0.98
TF-1097	Jaisalmer,Rajasthan	557	42.88±0.6
Beta-431507	Dumka,Jharkhand	600	66.0±0.2



Graph of Table1-- Depth in ft is on X axis and pMC is on Y axis.

Table--2

Sample Name	Place	Depth(ft.)	Radiocarbon Age(in years)
KHOP5[a]	South East Bangladesh	601	10290
CGO5D	South East Bangladesh	606	516
LCO6D	South East Bangladesh	639	11120
City of Lewiston#5	Idaho.	602	5074
Beta 431507	Dumka,Jharkhand,India	600	3340



In the Table-2 depth of the ground water source versus the radiocarbon age of the ground water samples has been plotted here in the graph II.

IV. Conclusion

The graphical analysis shown that there is no unique rule by which the variation of radiocarbon age and pMC of ground water samples are guided. This simply shows that the rate of production and decay in different hilly regions are found to be different for 14C radioisotope from the same type of reservoirs.

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