fodder and fuel, in handicrafts and even as house-building material[5]. Metagenomic approaches revealed a unique microbial diversity of phoomdis[6]. They are reported to harbour microorganisms with economic potential having diverse enzymatic activities[7]. Various bacteria and actinomycetes, producing antimicrobial compounds of medical importance, have been isolated from Loktak Lake[8,9].

The present study was undertaken to isolate bacteria producing multiple enzymes as well as those having plant growth promoting potential from Loktak Lake. The bacterial isolates obtained from the phoomdi sediment and lake water were screened for enzyme production (amylase, lipase, protease, cellulase, chitinase, xylanase, pectinase) and plant growth promoting factors (siderophore production, indoleacetic acid (IAA) production, nitrogen fixation, hydrogen cyanide (HCN) production, phosphate solubilization, ammonia production) and also for antifungal activity. The presence of plant growth promoting microorganisms was expected from phoomdi sediment, due to the fact that the local people use phoomdi sediment as a biofertilizer in agriculture. It exhibits good plant growth promotion which may be attributed to the presence of bacteria with plant growth promoting potential. Microorganisms present in the phoomdis contribute in nutrient recycling by secreting various hydrolytic enzymes and make the nutrients available to plants in absorbable form. Screening revealed the presence of multienzyme-producing bacterial isolates as well as isolates producing various plant growth promoting factors and having antifungal and antimicrobial activities against pathogens. These isolates from Loktak Lake have the potential to be used for the production of industrially important enzymes and in agriculture as plant growth promoters. Among the 26 Loktak bacterial isolates, *Enterobacter tabaci* strain KSA9 (accession no. MH005094) is found to produce siderophore, IAA, involved in nitrogen fixation, HCN production, phosphate solubilization and ammonia production. *Enterobacter tabaci* strain KSA9 can be used for sustainable agriculture in wetlands. *Aeromonas hydrophila* strain VSA7 (accession no. MG966450) produces amylase, lipase, protease, cellulase and chitinase (data not shown) which finds application in industries. Therefore, microbes from Loktak Lake have the potential to be used in agricultural and industrial applications.

However, due to the many hydropower projects, fisheries and other anthropogenic activities, there is an environmental threat to this ecosystem[6]. At present, the lake is facing serious ecological problems, viz. cultural eutrophication, siltation and pollution. The construction of the Ithai barrage without proper planning has led to dams in the lake, resulting in uncontrolled proliferation of Phoomdi, thus reducing the open lake area. This has blocked the migratory pathways of a number of fish species and degradation of catchment areas[10]. Thus, owing to versatility of this natural habitat of diverse groups of micro and macroflora, there is an urgent need for conservation of this fragile ecosystem. The life of thousands of people living in this area is dependent of the lake itself. The destruction of this lake will ultimately result in the loss of natural habitat for birds, fishes, wild animals, livelihood and also industrially and agriculturally important microbes. Most importantly, sustainable use of the resources is the only option to conserve the Loktak Lake.

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Uranium mineralization in metasediments of North Delhi Fold Belt of Buchara area, Jaipur district, Rajasthan, India

The Proterozoic Delhi Supergroup rocks of North Delhi Fold Belt (NDFB) is one of the prime targets for base metals, uranium and other economic mineral prospects[1]. Intensive exploration by the Atomic Minerals Directorate for Exploration and Research (AMD) has identified uranium mineralization in Khetri sub-basin of NDFB[2,3]. Geological and radiometric survey for uranium exploration has resulted in locating significant radioactivity from uranium around

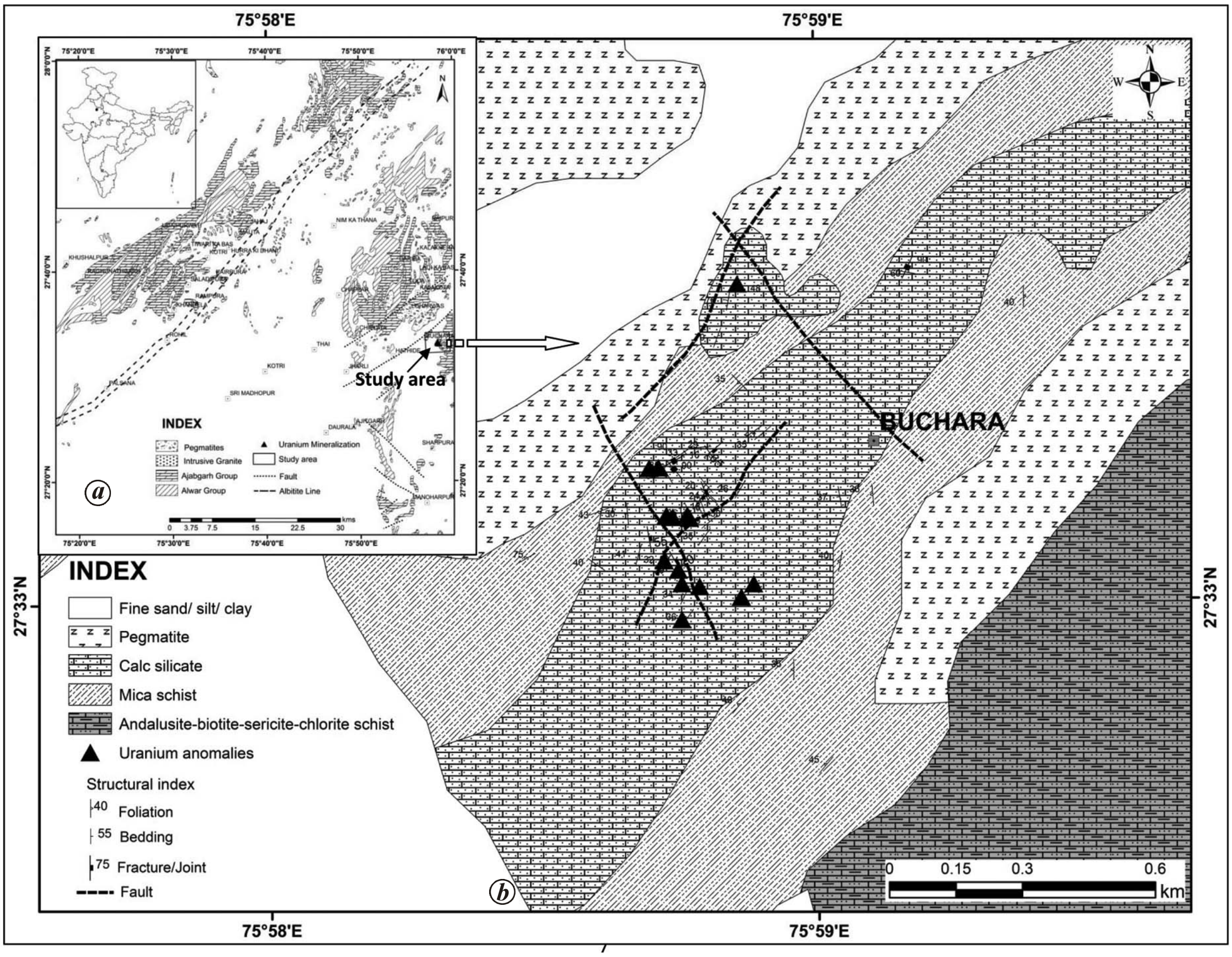

Figure 1. Geological map of (***a***) North Delhi Fold Belt, Rajasthan (after GSI, 1980) and (***b***) Buchara area, Jaipur district, Rajasthan, India.

Table 1. Physical assay results of samples

Sample no.	$\%eU_3O_8$	$\%U_3O_8$	$\%ThO_2$
RA/29	0.053	0.047	0.007
RA/31	0.16	0.14	0.014
RA/32	0.016	0.011	0.005
RA/B/42	0.015	0.17	0.016
RA/44	0.094	0.11	0.007
RA/50	0.022	0.010	<0.005
RA/B/50	0.019	0.015	<0.005
RA/51	0.024	0.018	0.006
RA/56	0.049	0.026	<0.005
RA/58	0.056	0.055	0.009
RA/59	0.69	0.63	0.062
RA/69	0.045	0.029	0.009

Buchara village, Jaipur district, Rajasthan, India. This communication reports the findings of preliminary investigations on uranium occurrence in Buchara area.

The surveyed area forms a part of Khetri sub-basin of NDFB and exposes Proterozoic rocks of arenaceous Alwar and argillaceous Ajabgarh Groups in the order of superposition[4] (Figure 1). The Alwar Group of rocks mainly comprises of mica schist, massive quartzite (feldpathic and gritty) and phyllite. The Ajabgarh Group of rocks is represented by quartzite, calc-silicate, phyllite and mica schist. These rocks are intruded by amphibolite, granite and later pegmatites along with quartz veins.

The area around Buchara exposes calc-silicate rocks, mica schist of Ajabgarh Group and pegmatites. The calc-silicate rocks are often exposed on the top of hillocks, while mica schist rocks are exposed at lower elevations. Bands and lenses of carbonaceous schist are observed within the mica schist. Intrusions of later pegmatites broadly show NNE–SSW trend. They cover significant part of the area. Alluvium cover delimits the rock exposure in the west and south.

Buchara area falls in the hinge zone of Todra–Buchara syncline (M. L. Bhatt, unpublished). The NNE–SSW to NE–SW trending calc-silicate rocks are flanked by mica schist in the east and west. Few isolated lenses of calc-silicate rocks also occur surrounded by mica schist. Calc-silicate rocks show gradual change in strike from NE–SW to NW–SE describing folded structure. The NE–SW and NW–SE trending faults have been inferred based on displacement in lithological contact, sudden change in dip amount and dip direction. They guide the local natural drainage system.

Uranium mineralization associated with calc-silicate rocks is located about a kilometre southwest of Buchara village. Detailed radiometric survey has revealed eight anomalous radioactive zones ranging from 4 m × 1 m to 68 m × 39 m in four hillocks (Figure 2). The physical assay results of grab samples ($n = 12$)

Figure 2. Photograph showing disposition of radioactive calc silicate in Buchara area.

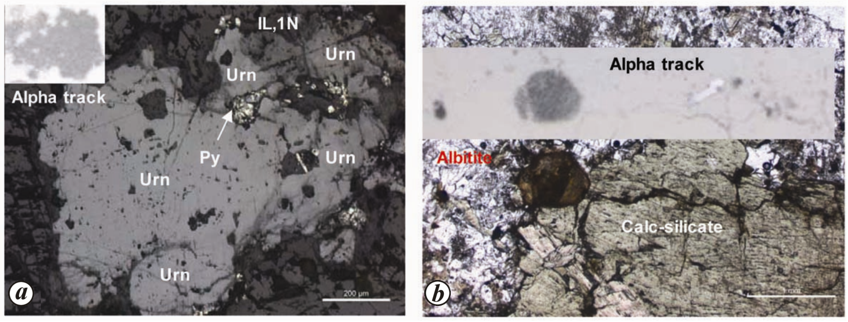

Figure 3. Photomicrographs showing (***a***) unaltered discrete grain aggregates of uraninite associated with pyrite registering very dense alpha tracks on CN-85 film and (***b***) uranium along the fracture and cleavage traces in calc-silicate minerals. Urn, Uraninite and Py, Pyrite.

indicate eU_3O_8 ranging from 0.015% to 0.69%, U_3O_8 from 0.010% to 0.63% and ThO_2 from <0.005% to 0.062% (Table 1). Carbonaceous mica schist in the area assayed 0.026% eU_3O_8, 0.025% U_3O_8 and <0.010% ThO_2 ($n = 1$).

Mineralized samples ($n = 2$) revealed 196–6029 ppm U_3O_8 (total) and 190–5703 ppm U_3O_8 (leachable) along with 44–778 ppm Pb and <10–91 ppm Mo. Petromineralogical studies indicated presence of silicified (aventurine-bearing), albitized calc-silicate with subordinate tremolite, diopside, wollastonite, scapolite, sphene and graphite. Euhedral aggregates of uraninite with inclusions of pyrite and often associated with molybdenite have been identified as the source of radioactivity (Figure 3). The presence of uraninite has also been confirmed by X-ray diffraction studies.

The association of uranium mineralization with albititic alteration and sulphides indicates the epigenetic nature of the former. The fault/fracture systems as a result of polyphase deformation in NDFB appear to have played an important role in the repeated circulation of uranium-bearing hydrothermal fluids causing remobilization and reconcentration of uranium. Reducing environment indicated by the presence of sulphides and carbonaceous schist might have provided favourable geochemical conditions for precipitation of uranium from hydrothermal fluids.

In the light of this finding of uranium mineralization in the axial region of Todra–Buchara syncline, follow-up exploration by detailed geological and structural mapping and drilling will help in proving the sub-surface continuity of structure-controlled hydrothermal-type uranium mineralization.

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