

**CONSOLIDATED REPORT OF RURAL MUSHROOM TECHNOLOGY FOR
ENTREPRENEURSHIP DEVELOPMENT WITH MUSHROOM CULTURE & FARMING**
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1. INTRODUCTION:

With the alarming growth of global population proportionate growth of food and nutrition is always a prime concern. The issue becomes even more grim with the depletion of potent agricultural land and other resources. One more issue which started finding importance among discussion of different forums is management of solid waste which includes agricultural waste as well. Mushroom cultivation is found to be popular answer to all the above concerns and which stands as a quality food requires less land and can be a tool to manage agricultural waste. Diversification in any farming system imparts sustainability. Mushrooms are one such component that not only impart diversification but also help in addressing the problems of quality food, health and environmental sustainability. Consumption of mushroom on daily basis boost the health of the consumer. The attributes are good for heart (no cholesterol), low calorie food (good for diabetic patient), prevents cancer (especially prostate and breast cancer by arresting the action of 5-alpha reductase & aromatase, these enzymes are responsible for growth of cancerous tumour), anti-aging property (the polysaccharide from Mushroom are potent scavengers of super oxide free radical), regulates digestive system, strengthen immunity. Mushroom like *Trametes versicolor* synthesize Polysaccharide-K (Kresin) which is a leading anti-cancer drug. Mushrooms are exclusively rich in Vit-D and folic acid among others. Mushroom is basically the fruiting body of fungi visible outside and can be seen by naked eye. Biologically Mushroom describes a variety of gilled fungi, with or without stems, and the term is used even more generally, to describe both the fleshy fruiting bodies or leathery fruiting bodies. Morphology deviating from the standard usually have more specific names such as bolete, puffball, stinkhorn and morel. The act of consuming mushrooms (mycophagy) dates back to ancient times. Edible mushrooms can appear either below ground (hypogeous) or above ground (epigeous) & edibility may be defined by criteria that include absence of poisonous effects on humans and desirable taste and aroma.

2. THEME (BACKGROUND) OF THE CONCEPT AT BODOLAND (ASSAM):

Mushroom- a low-cost health food, nutraceutical in nature having massive agro waste conversion ability, highest producer of protein per unit area & time, is highly suitable as a tool for developing rural entrepreneurship and sustainable development. Bio-conversion of Assam's surplus agro waste of 2.74 million Tons can be converted to mushroom industry of 1.37 million tons which have the potential of annual turnover of 21,117 crores. Further, agro climate of Bodoland Territorial Area District (BTAD, 6th Schedule Area) in particular and North Eastern States (Eastern Himalayan States) in general make mushroom cultivation highly suitable and feasible through series of easily understandable entrepreneurship & skill development trainings for the purpose. Further, virtues like minimal resource requirement, very low capital investment, less water requirement, less land requirement and wide availability of organic agro waste and presence of potential domestic and international market make mushroom cultivation venture as a model tool for stand up India & start up India concept. Mycophagy is a common practice in tribal community. Most of the people and rural youth of BTAD are from tribal & other communities and are mostly belong to economically backward families (BPL) who have started emerging as potential Indian youth despite having a recent hard past. Some of the communities inhabiting the area includes Boro, Garo, Dimasa, Rabha, Hajong, Lalung, Meche, Koch, Kosari, Gorkha, Assamese, Bengali, Adibasi etc. Department of Biotechnology, Bodoland University has identified this vital issue and with the help of DBT-GoI and local BTR Government (Dept. of Agriculture-BTR, DICC(BTR) and KVK, Kokrajhar started addressing the local, rural and women entrepreneurs, farmers with alternative and double income through mushroom based tools followed by their value addition and marketing. Initially the venture was confined to BTAD districts of Kokrajhar, Chirang, Baksa, Udalguri of Assam. Subsequently, it has spread to other districts of Assam and other states like Sikkim, West Bengal (Darjeeling & Kalingpong districts), Manipur, Nagaland, Arunachal Pradesh. Initially the work was conducted under DBT-Sponsored Institutional Biotech Hub but subsequently the work is carried out under DBT –sponsored ‘Technology Incubation Centre for entrepreneurship development through mushroom culture & farming’.

a)PRESENT STATUS:

The scheme has great impact on the rural places of Bodoland Territorial Area District of Assam. Along with the four districts of BTAD (6th Scheduled area) viz. Kokrajhar, Chirang, Baksa & Udalguri, Dhubri, Bongaigaon, Goalpara, Sonitpur, Kamrup, Nalbari, Karbi Anglong and Dima Hasao, Golaghat, Sonitpur, Nagaon, Kamrup, Jorhat, Dibrugarh, Tinsuikia, Karimganj, Hailakandi, Cachar district are covered. Some places of adjoining states of West Bengal, Sikkim, Nagaland, Manipur and Arunachal Pradesh is also covered. Transboundary region of India with Bhutan and Gelephu (Bhutan) is also covered. The project specifically covers and benefits fringe village of UNESCO world Heritage Site of Manas national Park (India) & Royal Manas National Park (Bhutan).

b)VISION: VISIONS:

Providing cheap and low cost health food (rich in Vitamin D and other essential nutrients) and providing employment/alternative income to 100000 farmers in BTR (with minimal or low cost capital investment) through rural technology on mushroom including value added mushroom

product with an outlook of zero waste management approach transforming BTR into International Mushroom Hub.

MISSION:

Capacity building & economic upliftment of frontline farmers by integrated zero waste management approach through Interventions on cultivation, processing, and value addition of mushroom DBT-GoI Technology Incubation Centre on Mushroom, Bodoland University, Assam at Chirang, Kokrajhar, Udalguri and Baksa Districts of Bodoland Territorial Region, Assam

- 1) **Training To Trading:** Mass scale training to rural entrepreneurs through entrepreneurship development programmes and linking their product to market
- 2) **Mass Scale Training :** In phase wise manner, training and subsequent advance training on Basic Mushrooms viz., Oyster Mushroom, Milky Mushroom and Paddystraw Mushrooms to farmers, advance Mushroom and super Mushroom
- 3) **Marketing:** Adopting measures to link the rural mushroom and their product to national and international markets
- 4) **Quality Assessment:** Quality assessment of the mushroom and their product before reaching out to market by Bodoland University for consumption of Organic mushroom
- 5) **Registration:** Registration of Mushroom farmers and adopting measures to avail them FSSAI and ISO Certificates

AIM, OBJECTIVE & GOAL::

Aim: Socio-economic upliftment and empowerment of rural entrepreneurs in mushroom culture and farming especially women entrepreneur. **Objective:** Bio conversion of agro solid waste through mushroom. **Goal:** Providing alternative income to rural entrepreneurs by eco-friendly green energy

c)METHODOLOGY:

Potential entrepreneurs (Individuals, SHGs, NGOs, etc.) are selected in consultation with KVKs, NRLM, District Developmental Blocks of four district of BTAD area and other part of Assam and other states The list of the SHGs so collected from the District Development Blocks have been targeted for the cultivation of mushrooms through series of steps. Selection of SHGs or Individual through secondary information. Making of low-cost mushroom house in the premises of beneficiaries of some entrepreneurs. Providing spot outdoor training for the mushroom species and simultaneously conducting awareness training to nearby people near the location. Availing spawn to the beneficiaries made in the centre. Cultivation of standard and popular mushroom initially

followed by popularization and upliftment of local mushrooms. Marketing of organic mushroom. After the production of mushroom, the entrepreneurs are also trained for value addition of the product like mushroom cake, rasgulla, mushroom custard, mushroom chowmein, mushroom soup, mushroom biscuit, mushroom papad, mushroom chocolate, mushroom soap, mushroom pickle, mushroom sauce, mushroom ketchup etc

d)DESIGN :

The Technology Incubation Centre basically works under **Lab to Land Initiative** so that small and medium scaled entrepreneurs of the remote fringe villages . The technology generated in laboratory of the centre as well as product like mushroom spawn is transferred to farmers for alternative livelihood generation (**double income**) and sustainable development specially in mountains. The venture can be initiated with a capital as low as Rs 25-Rs.30 so its highly feasible in mountains. This model of alternative livelihood generation is an example of **Waste to Energy (WTE) Programme** and **Training to Trading (T³) programme**. This is done and designed in **three phases**

1) First Phase: Training to Trading Programme

Here mass scale selected farmers and rural entrepreneurs are trained so that they can initiate the process of cultivation of mushroom and can find domestic market with easily cultivable mushrooms (Oyster, Milky & Paddy Straw Mushroom). Here Per Kilogram of mushroom empower them by **Rs 160 to Rs 480**. Here formal education and capital is not needed.

2) Second Phase: Advance Cultivation Business in Mushroom

Confident farmers from the first phase are selected for cultivating (Shiitake, Genoderma, Lions mane, Enoki, Wood ear Mushroom) which are edible and medicinal too. Here Per Kilogram of mushroom empower them from **Rs 1200 to Rs 3600**.

3) Third Phase: Business in Super & Specialty Mushrooms (Cordyceps or Caterpillar Mushroom). In this phase few people from the second phase are selected. This mushroom are specialty mushroom and need skill people. Here Per Kilogram of mushroom shall make them earn from **Rs 80,000 to Rs 200,000/-**. Here formal education & investment from farmers are required since these mushrooms are cultivated under aseptic conditions

MEDICINAL VALUES:

Mushrooms are extremely beneficial for heart (no cholesterol), low calorie food with dietary and fermentable fibre (good for diabetic patient), prevents cancer (especially prostate and breast cancer by arresting the action of 5-alpha reductase & aromatase, these enzymes are responsible for growth of cancerous tumour), antiaging property (the polysaccharide from mushroom are potent scavengers of super oxide free radical), regulates digestive system, strengthen immunity, anti-anaemic, have anti- tuberculosis property , anti-constipation, anti-obesity, can act as adaptogen (stress reliever), anti-viral effect, anti- microbial activity, rich in folic acid, vit.D, vit B2, Niacin, Biotin, Potassium, Copper, Zinc etc. Mushroom have very good quality proteins and are regarded as balanced food because of their role in osmoregulation since they are rich in ergosterol. Local mushrooms like oyster mushroom have anti-cholesterol compounds like

lovastatin making them most sort after food good for heart. Most important health benefits of mushrooms among others is that they have compounds which act as anti-inflammatory factor.

OVER ALL IMPACT

The scheme has great impact on the rural places of Bodoland Territorial Area District of Assam .Along with the four district of BTAD (6th Scheduled area) viz. Kokrajhar, Chirang, Baksa & Udalguri, Dhubri, Bongaigaon, Goalpara, Sonitpur, Kamrup, Nalbari, Karbi Anglong and Dima Hasao, Golaghat, Sonitpur, Nagaon, Kamrup, Jorhat, Dibrugarh, Tinsuikia, Karimganj, Hailakandi, Cachar district are covered. Some places of adjoining states of West Bengal, Sikkim, Nagaland, Manipur and Arunachal Pradesh is also covered. Transboundary region of India with Bhutan and Gelephu (Bhutan) is also covered. The project specifically covers and benefits fringe village of UNESCO world Heritage Site of Manas national Park (India) & Royal Manas National Park (Bhutan).

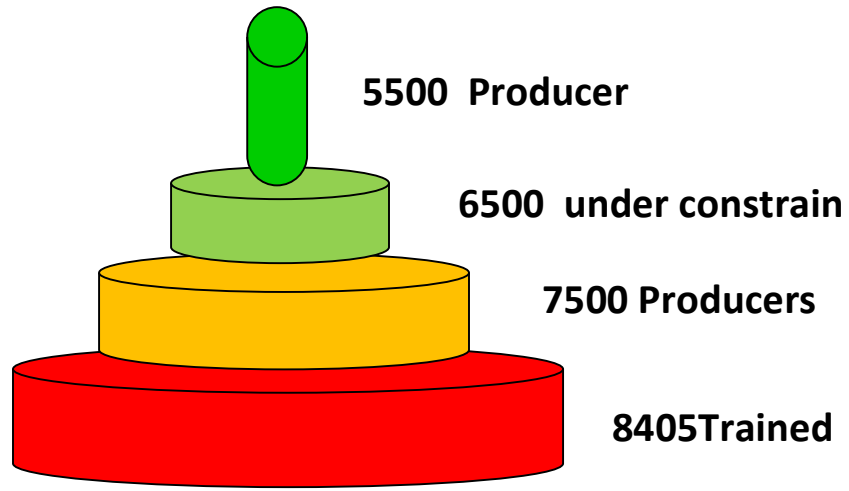
DBT-Govt. of India Technology Incubation Centre (Bodoland University, 2017-2020), DBT-Govt. of India-Biotech Hub and Advance Level Biotech Hub (Bodoland University, 2012-2019), DBT-Govt. of India -Kisan Hub (Bodoland University, 2022-2023), NEC Govt. of India-Community Training Centre on Mushroom (Bodoland University, 2022-2023) along with prime and immense contribution from Office of the Deputy Commissioner, Kokrajhar (2021-2023) and other agencies like KVK Kokrajhar, Chirang, Baksa, Udalguri have been consistently working in concert since a decade to uplift the socio economic condition of rural entrepreneurs of NER in general and BTR in particular with its main focus on Kokrajhar as ODOP.

1. Total 512 training conducted since 2012. 273 training from Bodoland University under different Govt. Schemes like DBT-GoI-TIC (Technology Incubation Centre on Mushroom), DBT-GoI Biotech Hub Programme, BU of which 256 is location specific training outdoor and 17 are indoor.
2. 03 Nos. of FPOs for other products including mushroom is also operating viz Raimona Food Industries, Swmkhar Agro Processing Unit etc.
3. Total of 5500 farmers have been trained since 2012. DBT-GoI Technology Centre on Mushroom, Bodoland University has trained 8405 farmers, rural entrepreneurs and student entrepreneurs.
4. DBT-GoI TIC,BU impart training on the 20 mushroom species. Under Oyster group *Pleurotus florida*, *Pleurotus flabellatus*, *Pleurotus sajor-caju*., *Pleurotus eryngii*, *Pleurotus sapidus*., *Pleurotus ostreatus*, *Pleurotus elm*., *Pleurotus pulmonarius*, *Pleurotus eous* , *Pleurotus djamor*, *Pleurotus cornucopiae* ,*Pleurotus citrinopileatus* are being used for training. Additionally Milky Mushroom, Paddystraw Mushroom, Button Mushroom, Shiitake Mushroom, Genoderma (Reishi Mushroom), Enoki Mushroom, Wood ear Mushroom, Lionsmane Mushroom, *Cordyceps militaris* and *Cordyceps sinensis*. Additionally culture of Morchella is also available.
5. Low cost mushroom unit of moderate capacity has been established
6. 71 low-cost house/unit made by DBT-TIC, BU.
7. Provided support to already existing 132 moderate farms
8. At Bodoland University State of Art, Mushroom lab was established for capacity building & economic upliftment of frontline farmers by integrated zero waste management

- approach through Interventions on cultivation, processing, and value addition of mushroom
9. The Centre has cater to the need of **71** different mushroom units, **4** clusters, **13** districts of Assam (& selected farmers of Mizoram, Meghalaya, Manipur, Arunachal Pradesh, Nagaland), **25** Govt. agencies
 10. For wider awareness about establishment of Mushroom Units, the Centre has participated in 5 Exhibitions
 - a) Participated in an Exhibition, Organized at Silver Jubilee cum State level celebration of National Children Science Congress from 25th to 28th October, 2018
 - b) Participated in an Exhibition at Kissan Mela, Organized by KVK, Kokrajhar on 13th December, 2018
 - c) Participated in an Exhibition at Golden Jubilee Celebration at Nath –Yogi Sanmilani, Bhutiapara, Kokrajhar from 20th to 22nd December, 2019
 - d) Participated in an Exhibition of 1st Bodoland Krishak Samaroh at Barama, Baksa, Assam organized by Dept. of Agriculture (BTC) from 9th to 11th January, 2020
 - e) Participated in an Exhibition at Kissan Mela organized by KVK, Chirang, Assam on 25th February, 2020
 - f) 61st Bodo Sahitya Sabha from 2nd May to 4th May, 2022 at Tamulpur.
 - g) Participated in North East Research Conclave at IIT-G from 20th -22nd May, 2022 and got the best University award in demonstration of Rural Technology
 - h) Mushroom Mela Organized by KVK Chirang on 20-1-2023
 - 1) Exhibition at Bodoland Agri-Allied Expo at Rowta 26 January to 29th January, 2023
 11. Mushroom related activities were also initiated in **26 Colleges, 15 secondary Schools, 503 SHGs and Alayaran Anath Ashram**
 12. Mushroom Help Line No.+919101952358 with whatsapp facility.
 13. www.ticdbtbu.in has been designed for wide information to farmer.
 14. TIC DBT (Bodoland University) app for eCommerce has been developed to help the farmers
 15. *Cordycep militaries* mushroom (known for antioxidants and energy boosters with a price of Rs.80,000 to Rs200,000 /kg) capsule has been made for energy boosters
 16. 50+ news coverage in local papers and two interview coverage was there in regional satellite news channels including one international patent.
 17. A mushroom manual on 11 language was written to make mushrooming more popular
 18. Fortified mushroom powder has been made by lyophilization
 19. With the fortified mushroom powder, ready to eat and ready to serve **mushroom soup powder** has been produced
 20. With the fortified mushroom powder, ready to eat and ready to serve **mushroom rasgulla** has been produced
 21. With the fortified mushroom powder, **mushroom biscuits** has been produced
 22. With the fortified mushroom powder, mushroom cake has been produced
 23. With the fortified mushroom powder, ready to eat and ready to serve mushroom papad has been produced

24. Mushroom pickle has been produced in three categories only mushroom, mushroom & Chilli, Mushroom & Vegetable.
25. Mushroom chips has also been initiated
26. Facilities for mushroom jam, sauce and ketchup has also been established.
27. With the fortified mushroom powder, mushroom chowmin has been produced
28. FSSAI license have been achieved with registration no 20319108000037
29. AFSTI membership for research in Mushroom Food Products was also attained and 27th Indian Convention for food scientist was also attended from 30th January to 1st February, 2020.
30. Market Survey was conducted in 27 districts out of 33 in Assam, 9 district showed very high demand, 11 district showed high demand and 6 district showed moderate demand
31. Marketing pattern of mushrooms have been documented in Assam under Non durable fast moving consumer goods .
32. ISO **ISO: 9001:2015** with details 20EQBQ60 has been achieved
33. Axom.Bazar an online e-platform for mushroom marketing is also developed by DBT-TIC-BU with one of student entrepreneurs Mr.Amrit Debnath.
34. There are a total of 6 You Tube tutorials
35. <https://dbtindia.gov.in/schemes-programmes/promoting-biotechnology-north-east-region/demonstration-and-scale-programmes> Link of DBT-GoI Website
36. Achieved international German Utility Model form of Patent on medicinal properties of gold nano particles synthesized from *Cordyceps militaris* mushroom
37. The capacity of spawn production of spawn lab of Technology Incubation Centre is 1.8 to 2.5 tons annually
38. At present, more than 5500 farmers are engaged in mushroom cultivation.
39. The average consolidated income of farmers was estimated to be ₹62,58,017 as of June 2022. The latest figures are estimated to be further enhanced by 23% up to January, 2023.
40. The Office of the Deputy Commissioner, Kokrajhar has been working with Bodoland University and concerned Departments. One impact of these multiple mushroom convergences (upstream and downstream) is that the number of SAM/MAM children (0-6 years) have come down by 80.18% from 1085 in September, 2021 to 215 in November, 2022.
41. Mushroom supplement in mid-day meals has been introduced with the help of Office of the Deputy Commissioner, Kokrajhar in various schools of Kokrajhar since 3rd February, 2022. The line of 13 mushroom-based high shelf-life products developed innovatively by TIC, have been used to enhance the palate of these children, in particular mushroom soup, mushroom biscuits etc.

3. IMPACT OF THE PROJECT/ TRANSFORMATION OF LIVES (FARMER/VILLAGERS):



Graph 1: Showing year wise training imparted



Fig 1-3 (left to right) designs of low cost self cooling mushroom hut designed by TIC



Fig 4-8 Different popular mushroom whose cultivation training are imparted by TIC



Fig 9-14 Different popular mushroom recipes including mushroom rasoullas made by TIC





Fig 15-29 Different farmers and other stakeholders in BTAD areas participating in Entrepreneurial activities



Mushroom Rasgullas





Plate showing making of fortified mushroom product



GOVERNMENT OF ASSAM
COMMISSIONERATE OF FOOD SAFETY, ASSAM
(Health & Family Welfare Department)
Registration under Food Safety and Standards Act, 2006
[See Regulation 2.1.1(5)]

Registration No. 2 0 3 1 9 1 0 8 0 0 0 0 3 7

1. Name and permanent address of Food Business Operator (FBO) M/S TECHNOLOGY INCUBATION CENTRE FOR ENTREPRENEURSHIP DEVELOPMENT ON MUSHROOM CULTURE AND FARMING
Dr.Sandeep Das C/O Dept.of Biotechnology,
Bodoland University, Deborgaon, Rangalikhata,
Kokrajhar Sadar Sub-Division, Kokrajhar (Assam), -
783370
2. Address of location where food business is to be conducted / premises Dr.Sandeep Das C/O Dept.of Biotechnology,
Bodoland University, Deborgaon, Rangalikhata,
Kokrajhar Sadar Sub-Division, Kokrajhar (Assam), -
783370
3. Kind of Business Distributer
Manufacturer/Processor
Mushroom Culture and Farming
4. Photo Identity Card PAN Card



This Registration is granted under and is subject to the provisions of Food Safety & Standards Act, 2006 all of which must be complied with by the licensee.

Place: Kokrajhar
Date of Issue: 04/05/2019
Period of Validity: 03/05/2024

Validation And Renewal

Issue / Renewal Date	Period of Validity	Registration fees paid	Item of Food Products manufactured / handled / sold	Signature of Registering Authority
04/05/2019	5 Year(s)	500 INR	Please refer to annexure for details.	

Disclaimer : 1 - This Registration Certificate is only to commence or carry on the food businesses and not for any other purpose.

2 - This is an electronically generated Registration Certificate and does not require any signature.



INTEGRATED ZERO OUTPUT OF RURAL MUSHROOM TECHNOLOGY PRACTISED AT DBT-GOI TIC, BU

EXISTING FACILITY



Certificate of Registration

This is to Certify that
Quality Management System of

**TECHNOLOGY INCUBATION CENTRE
BODOLAND UNIVERSITY**
NEW GIRLS HOSTEL, DEBORGAON, KOKRAJHAR,
ASSAM - 783370, INDIA.

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

**PRODUCTION OF NATURAL MUSHROOMS, MANUFACTURER AND
SUPPLIER OF MUSHROOM EXTRACT AND DERIVATIVES.**

Certificate No	: 20EQBQ60	Modification Date	: 29/09/2020
Initial Registration Date	: 27/06/2020		
Date of Expiry	: 26/06/2023		
1st Surve. Due	: 27/05/2021	2nd Surve. Due	: 27/05/2022



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über die Eintragung des
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Bezeichnung:

Durch Cordyceps Militaris vermittelte Goldnanopartikel mit antimikrobiellen,
antidiabetischen und antioxidativen Wirkungen

IPC:

A61K 33/242

Inhaber/Inhaberin:

Ali, Raju, Dr., Nalbari, Assam, IN
Amalraj, Singamoorthy, Thanjavur, Tamil Nadu, IN
Ayyanar, Muniappan, Thanjavur, Tamil Nadu, IN
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Gurav, Shailendra Shivaji, Dr., Goa, IN

Tag der Anmeldung:

27.09.2022

Tag der Eintragung:

20.10.2022

Die Präsidentin des Deutschen Patent- und Markenamts



Cornelia Rudloff-Schäffer

München, 20.10.2022



Die Voraussetzungen der Schutzfähigkeit werden bei der Eintragung eines Gebrauchsmusters nicht geprüft.
Den aktuellen Rechtsstand und Schutzzumfang entnehmen Sie bitte dem DPMAregister unter www.dpma.de.

**INTERNATIONAL GERMAN PATENT ON MEDICIN
PROPERTIES OF GOLD NANO PARTICLES SYNTHESIZ
FROM *CORDYCEPS MILITARIS* MUSHROOM**



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Nagaland set to begin first bird count
Nagaland set to begin first bird count...



School enrolment has declined, govt. report
School enrolment has declined, govt. report...



A look at where parties stand in Gujarat
A look at where parties stand in Gujarat...

Imran Khan wounded in 'clear assassination bid'

Wanted to kill Khan for misleading people, spy suspect in reported footage of the shooting at anti-government protest, several others in the former PM's entourage were injured

Imran Khan, who was shot in the chest on Thursday...



Imran Khan, who was shot in the chest on Thursday...

Gujarat to vote in 2 phases, results to be out on December 8

Battle lines drawn
Gujarat will go to polls in two phases in December 8 and 15.



Of the 30 constituencies in the state, 15 will be contested in the first phase...

Transt staff cut appeal to DGP

Transt staff cut appeal to DGP
Transt staff cut appeal to DGP...

Transt staff cut appeal to DGP
Transt staff cut appeal to DGP...

Registration revenue up
Registration revenue up...

Punjab govt. failed to curb stubble burning

Punjab govt. failed to curb stubble burning
Punjab govt. failed to curb stubble burning...

Festive heats



Just arrest me if I'm guilty, Soren tells EI

Just arrest me if I'm guilty, Soren tells EI
Just arrest me if I'm guilty, Soren tells EI...

A gold-mushroom combo to ease drug delivery

A gold-mushroom combo to ease drug delivery
A gold-mushroom combo to ease drug delivery...

Jamaat members visit temple, send out message of harmony

Jamaat members visit temple, send out message of harmony
Jamaat members visit temple, send out message of harmony...

Registration revenue up

Registration revenue up
Registration revenue up...

A gold-mushroom combo to ease drug delivery

Bodoland University's collaborative work on fungus-powered biosynthesised nanogold particles earns international patent

Rahul Karmakar
GUWAHATI

Medicines may soon have traces of ultramicroscopic gold powered by a super mushroom for greater efficacy.

Cordy gold nanoparticles (Cor-AuNPs), the outcome of a collaborative experiment by scientists from four Indian institutions, has earned an international patent from Germany.

These nanoparticles, derived from the synthesis of the extracts of *Cordyceps militaris* and gold salts, could make drug delivery in the human body faster and surer.

Cordyceps militaris is a



Key agent: Lab-grown *Cordyceps militaris*. SPECIAL ARRANGEMENT

high-value parasitic fungus, lab-grown at the Department of Biotechnology's

Technology Incubation Centre (TIC) in Bodoland University, one of the collaborators of the patented work. Gold salts are ionic chemical com-

pounds of gold generally used in medicine.

Better penetration

"Penetration in the cells is more when the drug particles are smaller. *Cordyceps militaris*, called super mushroom for its tremen-

dous medicinal properties, adds bioactive components to the synthesis of gold nanoparticles for better penetration," Sandip Das, head of the incubation centre, told *The Hindu*. He was a contributor to developing Cor-AuNPs along with Vashkar Biswa and Raju Ali from Bodoland University.

Scientists' team

The other collaborators were Shailendra Gurav, Nilambar Gurav and Girish Gawas of Goa University's Department of Pharmacology; Pradeep Gandhale from the National Institute of High Security Animal Diseases in Bhopal, Madhya Pradesh; and Singamoorthy Amalraj and Mu-

niappan Ayyanar of AVVM Sri Pushpam College in Thanjavur, Tamil Nadu.

Dr. Das and Mr. Biswa have been working extensively on the genetic diversity and medicinal properties of the wild *Cordyceps* mushroom found in the eastern Himalayan belt. Over eight years, they standardised the cultivation of this mushroom with antimicrobial, antidiabetic and antioxidant properties.

"Biosynthesised nanogold particles indicate a new application of nanoparticles in the development of therapeutic drugs that can be delivered as ointments, tablets, capsules, and in other forms," the team behind Cor-AuNPs said.

