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3.7.1.1: Number of functional MoUs with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during the last five years

Index - 2019-2020

3.	2019-2020	Punjab Energy Development Agency, Chandigarh	Perpetual	Research & Development Projects on Energy Conservation & Energy Efficiency under "State Energy Efficiency Reseach & Outreach Program" of Bureau of Energy Effciency, Ministry of Power, Government of India	1. Student visit to Punjab Energy Development Agency, Chandigarh 2. PEDA training programme on energy conservation	24,27
4.	2019-2020	ICAR - Central Soil Salinity Research Institute, Karnal	Five years	For Collaboration for Post Graduate Research	Student visit at CSSRI Karnal	34
5.	2019-2020	Department of Science, Technology & Environment, Govt. of Punjab, Chandigarh	Five years	To develop model villages in the vicinity of DAV University	Model development of village Sangowal	38,39
6.	2019-20	UNIVERSITY OF KASHMIR	Perpetual	Research Collaboration	Publication	41
7.	2019-20	MIT-ADT University	Perpetual	Research Collaboration	Publication	54
8.	2019-20	Jamia Millia Islamia	Perpetual	Research Collaboration	Publication	67

Department of Science, Technology & Environment, Government of Punjab

DAV University, Jalandhar

Memorandum of Understanding

This Memorandum of Understanding (MoU) is entered into on the 16 day of October, 2019 at Chandigarh.

Between

The Department of Science, Technology & Environment, Government of Punjab, Chandigarh (hereinunder referred to as 'DSTE-GoP' which expression shall where the context so admits include its successors and permitted assigns) of one part.

And

DAV University, Jalandhar (hereinafter referred to as 'DAV University' which expression shall where the context so admits include its successors and permitted assigns) of the other part.

Whereas, the Parties recognize the need to jointly address the issues of state importance pertaining to the environment, climate change and public health to achieve the overall goals and objectives of newly launched Mission Tandrust Punjab 2.0.

And whereas, the Parties recognize the need for promoting Research and Innovation (R&I) ecosystem in the State and particularly using Research and Innovation to enhance competitiveness, boost economic growth and create quality jobs.

And whereas, the Parties have expressed the desire to work together to promote collaborative programmes to make Punjab the R&I Hub and the healthiest State with healthy environment so as to enhance the adaptive capacity and resilience of the State towards emerging challenges.

In witness whereof the Parties now agree to the following :

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Registrar
DAV University, Jalandhar

Article-1 : Broad areas of Cooperation

1. The DSTE-GoP and DAV University, Jalandhar have identified the following areas of mutual interest for cooperation:

(i). Partnership to undertake state specific collaborative research & innovative programs in the areas of Environment, Public Health and Life Sciences.

(ii). To develop and promote model village in terms of air, water & soil quality, waste management, rain harvesting, zero burning of paddy straw, etc. and to replicate the initiative in other villages.

(iii). Jointly organize Innovation Summits/Conclaves, capacity building & awareness programmes to promote research and innovation in the State.

(iv). Any other area of cooperation that may be mutually agreed upon.

2. The DSTE-GoP and DAV University, Jalandhar have jointly identified above said areas for both short and long-term collaboration and will continue to identify additional actions, as required from time to time. The scope of work, financial implications, source of funds, terms of reference & time lines would be determined and mutually agreed to, on a case to case basis.

3. Both Parties will jointly identify financial resources and facilitate implementation of mutually identified activities.

4. Without prejudice to their endeavours to work together, both the Parties shall be free to work independently with other organizations as well, in the areas of mutual cooperation as identified in Para 1 above.

5. Neither Party shall incur any liability, financial or otherwise, on behalf of the other party, without prior written consent of the other Party.

6. The DSTE-GoP and DAV University, Jalandhar may decide mutually all other matters and activities that have not been specially mentioned or provided in the MoU.

Article-2 : Validity

This MoU shall be valid for FIVE years from the date of its execution. However, agreements concluded under this MoU shall be valid till the end of contracting obligations and responsibilities of the concerned Parties. The validity of this MoU can be further extended with the mutual consent of the Parties in writing.

Article-3 : Termination

This MoU can be terminated by either party by serving one month notice in writing, without assigning any reason, subject to completion of assignments in hand.

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Article-4 : Governing Law

Laws of India shall govern the MoU.

Article -5 : Arbitration

That the disputes, if any, shall be subject to arbitration if mutual consultations between the parties i.e. DAV University, Jalandhar and Department of Science, Technology & Environment, Government of Punjab, Chandigarh, fail to resolve the issue. The arbitration shall be strictly in accordance with the Arbitration Act as amended from time to time. That the jurisdiction in the event of disputes arising out of the terms of the agreement shall be Jalandhar/Chandigarh court.

In witness thereof, the undersigned duly authorized thereto have signed this Memorandum of Understanding.

R.K. Verma, IAS
Principal Secretary
Department of Science, Technology
Environment, Govt. of Punjab

Desh Bandhu Gupta
Vice-Chancellor
DAV University, Jalandhar

Witnesses:

1. Executive Director,
Punjab State Council for
Science & Technology.

2. Dr. Tarsem Rishi
Dean Student welfare
DAV University
Jalandhar.

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DAV University, Jalandhar

Activity -1

1. **Name of Event: 5-Day training on "Value Addition to Summer crops for Preservation":**

   Date: 12 July 2022

It was organized by DAV University on 12 July, 2022 in collaboration with NIT Jalandhar and Krishi Vigyan Kendra, Nurmahal; Department of Agriculture and Farmer Welfare, Jalandhar funded by Punjab State Council for Science & Technology, Department of Science and Technology, Government of India. A total of 30 participants attended the program.

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ਲੜੀ ਨੰ.	ਮੈਂਬਰ ਦਾ ਨਾਂ	ਪਿਤਾ/ਪਤਨੀ/ਪਤੀ ਦਾ ਨਾਂ	ਜਨਮ ਮਿਤੀ/ GEN/SC/ST/OBC	ਦਸਤਖਤ
1	ਪੂਜਾ	ਸ਼੍ਰੀ ਹਰੀਸ਼ ਕੁਮਾਰ	10/12/1997 BC	Pooja
2	ਬਲਿੰਦਰ ਕੌਰ	ਸ਼੍ਰੀ ਕਿਸ਼ਨ ਕੁਮਾਰ	09/12/1982 GN	Balinder Kaur
3	ਸੰਦੀਪ ਕੌਰ	ਸ਼੍ਰੀ ਸੰਜੀਵ ਕੁਮਾਰ	05/10/1985 GN	Sandeep
4	ਰਾਜ ਕੁਮਾਰੀ	ਸ਼੍ਰੀ ਰਾਮ ਕੁਮਾਰ	15/7/1986 SC	Rajkumari
5	ਪਰਮਿੰਦਰ ਕੌਰ	ਸ਼੍ਰੀ ਗੁਰਮੁਖ ਸਿੰਘ	12/9/1994 SC	Parminderkaur
6	ਰਵਿੰਦਰ ਕੌਰ	ਸ਼੍ਰੀ ਹਰੀਸ਼ ਕੁਮਾਰ	29/12/1975 SC	Ravinder Kaur
7	ਜਸਵੀਰ ਕੌਰ	ਸ਼੍ਰੀ ਬਲਵਿੰਦਰ ਸਿੰਘ	15/3/1970 GN	Jasviram
8	ਕਮਲੇਸ਼ ਰਾਣੀ	ਸ਼੍ਰੀ ਰੂਪ ਲਾਲ	25/12/1978 SC	Kamlesh Rani
9	ਮੀਨਾ ਰਾਣੀ	ਸ਼੍ਰੀ ਰਾਮ ਲਾਲਜੀ	13/01/1983 SC	ਮੀਨਾ ਰਾਣੀ
10	ਗੁਰਬਖਸ਼ ਕੌਰ	ਸ਼੍ਰੀ ਚੰਡਨ ਦਾਸ	13/7/1979 SC	ਗੁਰਬਖਸ਼ ਕੌਰ

Activity -2

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Activity -2

2. **Name of Event: Awareness campaign for National integration at village Kishangarh.**

   Department : Zoology

   Date: 15 August 2022

It was organized by DAV University on 15 August, 2022 in collaboration with NIT Jalandhar funded by Punjab State Council for Science & Technology, Department of Science and Technology, Government of India. A total of 50 participants attended the program in the village Kishangarh.

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Activity -3

3. **Name of event: Swachta Pakhwara at village Nussi, Jalandhar**

   Department of Zoology

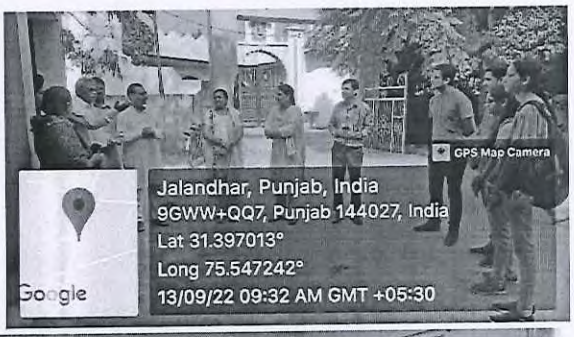
   Date : 13 September 2022

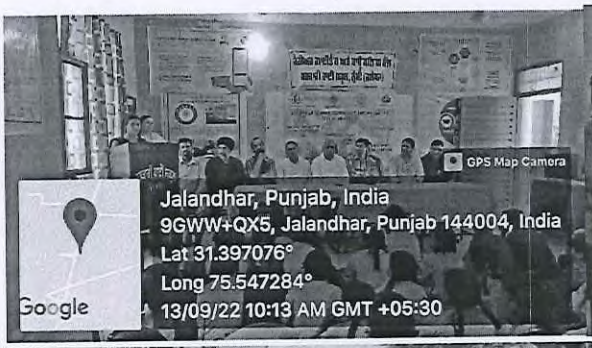
It was organized by DAV University on 13 September, 2022 in collaboration with Govt. High School, Nussi, NIT Jalandhar funded by Punjab State Council for Science & Technology, Department of Science and Technology, Government of India. A total of 68 participants attended the program in the village Nussi, Jalandhar.

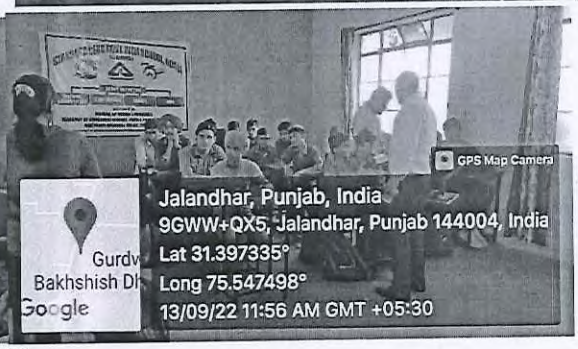
G. H. S., Nussi (Jalandhar)

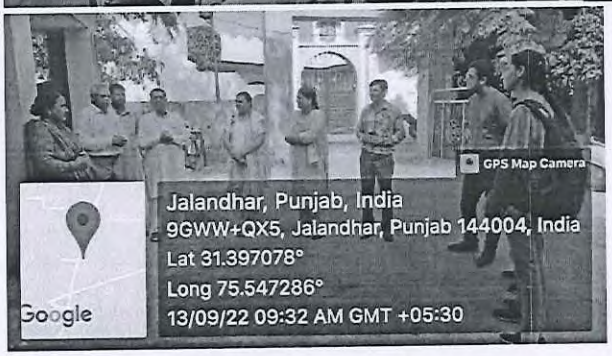
1.	Diya	(10th)
2	Jasmeen Bhatti	"
3.	Rohit	"
4	Gautam Dugg	"
5	Anmoldeep kaur	"
6	Heena	"
7.	Manpreet kaur	"
8	Muskan	"
9	Nishant Dugg	"
10.	Simran	"
11.	Jatin Bhatti	"
12.	Manvi	"
13	Damanpreet kaur	(9th)
14	Vaishnavi	"
15	Gurleen	"
16	Nishu	"
17	Sourav	"
18	Nargis	"
19	Amanjit Singh	"
20	Nishant Bhatti	"
21	Jashanpreet	"
22	Amanpreet kaur	"
23	Japneet kaur	(8th)
24	Lovejot	"
25	Prabhjot	"
26	Shapal	"
27	Naman	"
28	Saloni Bhatti	"
29	Anjali	"
30	Sahil Dugg	"
31	Harsh Dugg	(8th)
32	Dishant	"
33	Ravinder Singh	"
34	Manjot	(7th)
35	Lalita	(8th)
36	Rajwinder	"
37	Harpreet Rai	"
38	Yash kumar	"
39	Jasleen	"
40	Chetan	"
41	Kartik Bangar	(7th)
42	Udbag Rai	"
43	Anita	"
44	Jaskaran	"
45	Vivek	"
46	Anjani	"
47	Yogesh	"
48	Nidhi	"
49	Abnoor	"
50	Laxmi	(6th)
51	Arpita	(6th)
52	Khushi kumari	"
53	Herry	"
54	Harry Duggal	"
55	Harman	"
56	Sonam	"
57	Navjot	"
58	Paramveer	"
59	Radhika	"
60	Suraj kumar	"

61	Bhavjit	(6th)
62	Nitesh	"
63	Rahul	"
64	Beauty kumari	"
65	Gayatri kumari	"
66	Nishu	"
67	Shiv kumar	"
68	Jaismeen	"









Activity -4

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4. **Name of Event: Enterpreneurship Assistance Program (EAP) in Village Karari**
   Department : Zoology
   Date: <u>(13-14/09/2022)</u>

It was organized by DAV University in the year 2022 in collaboration with NIT Jalandhar funded by ICICI Foundation and Punjab State Council for Science & Technology, Department of Science and Technology, Government of India. A total of 31 participants attended the program.

Attach Attendance of the participants on plain paper in following format and attach along with the EAP Report
(Attach additional sheet if required)

Sr. No.	Name of the Participant	Age	Male / Female	First Preference of training	Second preference of training	Mobile Number	Signature of Participant
1	Seema Rani	37	F	Mushroom	Spices	9501712742	Seema Rani
2	Raj Kumari	25	F	MC	Organic Farming	7347485933	Raj Kumari
3	Parminder Kaur	38	F	MC	Spices	7529973103	Parminder Kaur
4	Jasvir Kaur	51	F	MC	Bakery	9815949127	[illegible]
5	Kulwinder Kaur	46	F	MC	Spices	9915732394	[illegible]
6	Santosh Kumari	48	F	MC	Spices	9779096437	Santosh Kumari
7	Jaspreet Kaur	30	F	MC	Spices	[illegible]	[illegible]
8	Kamal	31	F	MC	Bakery	9915829149	[illegible]
9	Jaspreet	42	F	MC	Spices	9501127798	[illegible]
10	Balwinder Kaur	37	F	MC	Bakery	8427761526	Balwinder Kaur
11	Sandeep Kaur	37	F	MC	Bakery	7779564067	Sandeep
12	Pooja	25	F	MC	Bakery	[illegible]	Pooja
13	Gurbaksh Kaur	43	F	MC	Spices Sauce	9815171445	[illegible]
14	Surinder Kaur	60	F	MC	Sauce	9872797022	[illegible]
15	Raj Rani	72	F	MC	Spices	9814868801	
16	Ram Pyari	65	F	MC	Spices	8146295355	
17	Amarjeet Kaur	50	F	MC	Spices	9815428951	Baljinder Kaur
18	Baljinder Kaur	56	F	MC	Spices	7007600479	Parvesh Rani
19	Parvesh Rani	35	F	MC	Bio Product [illegible]	8146198020	Parveen Kumari
20	Parveen Kumari	36	F	MC	Spices	9877703603	[illegible]
21	Raj Kumari	30	F	MC	Spices	8283924690	[illegible]
22	Sukhvinder Kaur	36	F	MC	Spices	9872364147	Sarbjit Kaur
23	Sarabjeet Kaur	36	F	MC	Spices	9915367920	[illegible]
24	Shambu Ram	63	M	MC	Spices	9914390537	
25	Bimla Rani	60	F	MC	Spices		Bimla Rani

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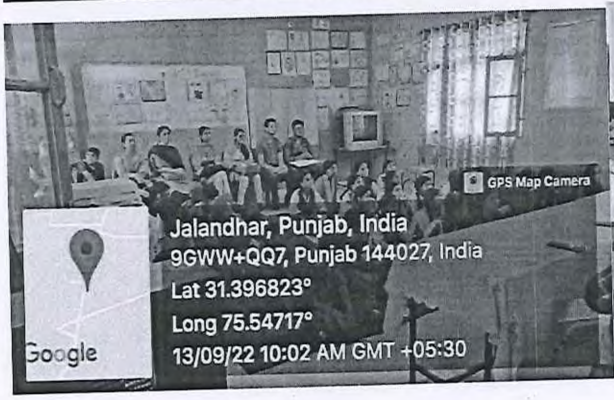
Attach Attendance of the participants on plain paper in following format and attach along with the EAP Report
(Attach additional sheet if required)

Sr. No.	Name of the Participant	Age	Male / Female	First Preference of training	Second preference of training	Mobile Number	Signature of Participant
26	Rishma Kaur	55	F	MC	[illegible]	[illegible]	[illegible]
27	Ram Asra	63	M	MC	[illegible]	[illegible]	[illegible]
28	Sunita Rani	60	F	MC	[illegible]	[illegible]	[illegible]
29	Asha Rani	48	F	MC	[illegible]	[illegible]	[illegible]
30	Laxmi	48	F	MC	[illegible]	98767-97035	[illegible]
31	[illegible]	43	F	MC	[illegible]		



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Activity -5

5. **Name of Event: Enterpreneurship Assistance Program (EAP) in Village Nussi**

   Department : Zoology

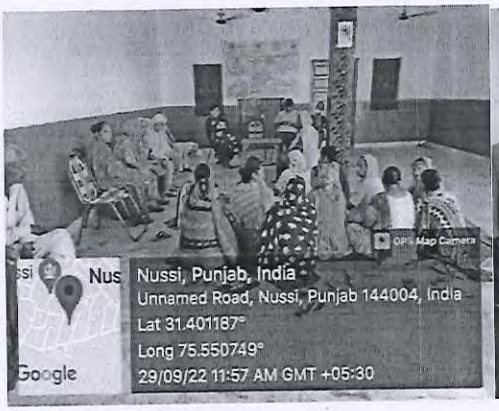
   Date: 29 September, 2022

It was organized by DAV University on 29 September, 2022 in collaboration with NIT Jalandhar funded by ICICI Foundation and Punjab State Council for Science & Technology, Department of Science and Technology, Government of India. A total of 35 participants attended the program in village Nussi.

ICICI Foundation

Attach Attendance of the participants on plain paper in following format and attach alongwith the EAP Report (Attach additional sheet if required)

Sr. No.	Name of the Participant	Age	Male / Female	First Preference of training	Second preference of training	Mobile Number	Signature of Participant
1	Rashi Rani	70	M			-	-
2	Ramesh Rani	60	M			-	
3	Meena	46	F			-	
4	Sunita Rani	45	F			8427551930	
5	Sheela	30	F			7696325659	
6	Neetu Rani	32	F			9872745328	
7	Pushpa	40	F			- -	
8	Roopa	45	F			-	
9	Ramsha	60	F			-	
10	Raj Rani	18	F			-	
11	Jeeto	70	F			- -	
12	Kajal	35	F			9855991414	
13	Geeta Rani	32	F			9781764761	
14	Seema Devi	40	F			7340974837	
15	Amrmeet Kaur	50	F			-	
16	Tejbeer Kaur	60	F			-	
17	Nirmala	40	F			8872455956	
18	Balvinder Kaur	45	F			9653250905	
19	Akhil Sharma	32	M			78885 33219	
20	Harvinder Kaur	28	F			9915731993	
21	Sandesh Kumari	32	F				



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DAV University, Jalandhar

Activity -6

6. **Name of Event: Enterpreneurship Assistance Program (EAP) in Village Sarmastpur**

   Department : Zoology

   Date: 30 September 2022

It was organized by DAV University on 30 September, 2022 in collaboration with NIT Jalandhar funded by ICICI Foundation and Punjab State Council for Science & Technology, Department of Science and Technology, Government of India. A total of 22 participants attended the program in village Sarmastpur.

ICICI Foundation

Attach Attendance of the participants on plain paper in following format and attach alongwith the EAP Report
(Attach additional sheet if required)

EAP. Sarmast Pur. Date- 30/9/2022

Sr. No.	Name of the Participant	Age	Male / Female	First Preference of training	Second preference of training	Mobile Number	Signature of Participant
1	Amarjit Kaur	40	F			8868334497	Amarjit Kaur
2	Renu Bala	35	F			6239632583	Renu Bala
3	Sunita Rani	34	F			8968133152	Sunita Devi
4	Rajinder Kaur	31	F			9779300881	Rajinder Kaur
5	Kamaljit Kaur	42	F			8146015287	Kamal Jit Kaur
6	Narinder Kaur	45	F			9872012989	Narinder Kaur
7	Darshan Kaur	60	F			8146940768	Darshan Kaur
8	Manjeet Kaur	43	F			9855088716	Manjeet Kaur
9	Subhdeep Kaur	37	F			9815230736	Gurdeep Kaur
10	Anju Bala	37	F			9056141966	Anju Bala
11	Manjeet Kaur	46	F			9463876871	Manjit Kaur
12	Parveen Kaur	28	F			98154 53041	Parveen Kaur
13	B. Rani Kaur	55	F			9915041719	[illegible]
14	Paramjeet Kaur	50	F			9779300881	[illegible]
15	Jaswinder Kaur	29	F			9815242826	Jasvinder Kaur
16	Somnath	24	M			9815242216	S...
17	Manpreet Kaur	26	F			—	Manpreet Kaur
18	Kaushalya Devi	52	F			9872854862	[illegible]
19	Kiran Bala	38	F			98786 47503	Kiran Bala
20	Sarbjeet Kaur	50	F			9872842903	[illegible]

ICICI Foundation

Attach Attendance of the participants on plain paper in following format and attach alongwith the EAP Report
(Attach additional sheet if required)

Sr. No.	Name of the Participant	Age	Male / Female	First Preference of training	Second preference of training	Mobile Number	Signature of Participant
21	Raj Rani	47	F			9915278467	Raj Rani
22	Sarabjeet Kaur	40	F			9915643113	Sarbjit Kaur

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DAV University, Jalandhar

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ICAR-Indian Institute of Wheat & Barley Research, Karnal (Haryana)

DAV University, Jalandhar

A MEMORANDUM OF UNDERSTANDING FOR COLLABORATION FOR POST-GRADUATE RESEARCH

Between

ICAR-INDIAN INSTITUTE OF WHEAT AND BARLEY RESEARCH (Karnal, Haryana)

And

DAV UNIVERSITY, (Jalandhar, Punjab)

ICAR-Indian Institute of Wheat and Barley Research, Karnal - 132001, Haryana, India under the aegis of Indian Council of Agricultural Research, is an apex body in the realm of wheat research, development and training which is more particularly concerned with quality and production. The organisation was started in 1978 as a Directorate and shifted to Karnal in 1990 and in the last 3 decades, it has earned national and international recognition for its outstanding contribution in the area of research on various aspects including quality of wheat for end product making and barley for industrial application in malting/brewing. All interdisciplinary research work on Agronomy, Breeding, Biotechnology, Seed Health, Soil and water utilization, grain Quality aspects of wheat, Bioinformatics, Economics, Extension, Computer applications etc., on wheat and barley are being undertaken as per mandate of the institute with the competent faculty. Trainings are also imparted on these aspects at national level.

At present the centre has a scientific staff /positions with specializations in Agronomy, Soil sciences, Plant Breeding, Entomology, Plant Pathology, Wheat Physiology, Agricultural Economics, Agricultural Extension, Statistics, Biochemistry, Biotechnology and Seed Production etc. These scientists are well trained in their field in India and abroad. There are several prestigious international collaborative projects ongoing at the ICAR-IIWBR. The centre has well-equipped laboratories having most modern scientific instruments/facilities. The institute has excellent physical and technical facility for doing research on wheat and barley production. It is, therefore, proposed to extend collaborative efforts with DAV University (Jalandhar, Punjab) which is having adequate facilities in post graduate teaching and research.

Understanding the scope of participation in this program, the DAV-U, hereafter refer to as the collaborating University and the ICAR-Indian Institute of Wheat and Barley Research, Karnal hereafter refer to as ICAR-

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IIWBR of the Indian Council of Agricultural Research, sign the memorandum of understanding (MOU) for jointly undertaking the post-graduate education/research program, in the field of wheat and barley quality and production with the following terms and conditions and agree to carry out there respective responsibilities as detailed in the MOU.

Terms and conditions

1. The following terms and conditions will be applicable to both the collaborating University and ICAR-IIWBR, as specified in the sub clauses below:

   1.1 The yearly programme of admission, number of seats in each subject, PG teaching, student's accommodation in the hostels, area of research etc. will be the responsibility of the collaborating University and shall be as per the university rules & policies.

   1.2 The degree will be awarded by the DAV-U.

   1.3 If the major advisor of the PG student feels that Faculty or facilities of the ICAR-IIWBR may be helpful in the student's research, the collaboration of ICAR-IIWBR may be sought.

   1.4 Any scientist of ICAR-IIWBR fulfilling the qualifications/requirements of PG teachers of DAV-U, on the recommendation of the Director, ICAR-IIWBR may be appointed as major / co-major advisor in the advisory committee of the student as per mutual agreement with the competent authority of the University depending upon the topic of research for thesis and time sharing. ICAR-IIWBR will permit the concerned scientist to act as major / co-major advisor (Co-Guide) of the student.

   1.5 The nature of the research undertaken by the student(s) will be preferably related to the wheat and barley interdisciplinary research work on Agronomy, Breeding, Biotechnology, Seed Health, Soil and water utilization, Quality aspects of wheat, Bioinformatics, Agricultural Economics, Agricultural Extension, Computer applications etc. and will be agreed to by the student's advisory committee and concerned competent authority of the university.

   1.6 Such student will be allowed to utilize the scientific material and physical facilities of ICAR-IIWBR with proper approval of the concerned authorities.

   1.7 The ICAR-IIWBR would also provide facilities required for research by any other Faculty Member/student of above mentioned disciplines (Clause 1.5) on reciprocal basis provided it does not hinder the natural functioning of the University.

   1.8 The help rendered by ICAR-IIWBR will be properly acknowledged in the thesis and any research paper/other publication/award emerging out of the research work carried out by the students in collaboration with ICAR-IIWBR will be jointly shared. The student will be expected to protect the Intellectual Property Rights (IPRs) generated or likely to be generated during his/her research work. The IPRs shall rest with the institution where the major part of the

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research work is carried out by the student. In the event of equal amount of work being carried out at both ICAR-IIWBR and the university, patents/protections/knowledge generated will be shared in proportion as per mutually settled terms by ICAR-IIWBR and DAV-U.

1.9 The ICAR-IIWBR/Collaborating University will abide by the rules and regulations of the respective organizations.

1.10 All questions/issues related to this MoU shall be settled amicably by both parties and disagreement if any shall be forwarded for settlement by arbitrator of mutual acceptance.

Executed this 28th day of November 2019 for a period of 5 years, and further extendable with the consent of both the parties.

In Witness Whereof, the authorized representatives of both parties have hereunto affix their signature below:

For the

ICAR-Indian Institute of Wheat and Barley Research

28/11/19

Director डॉ. जी.पी सिंह/Dr. G.P. Singh
निदेशक/Director
भा.कृ.अनु.प.-भारतीय गेंहू एवं जों अनुसंधान संस्थान
ICAR-Indian Institute of Wheat & Barley Research
करनाल-132001(भारत)/KARNAL-132001 (India)

Vice Chancellor
DAV UNIVERSITY
JALANDHAR

Vice Chancellor

Signed in the presence of

28/11/19

Coordinating Scientist

ICAR-Indian Institute of Wheat and Barley Research

Karnal. Haryana-132 001

Director of Research / Dean

Registrar

Signed in the presence of

ATTESTED

Registrar
DAV University, Jalandhar

Faculty of Agricultural Sciences
DAV University, Jalandhar

Event Report

Name of the Event: Visit to the research farms and interaction with ICAR- IIW&BR, Karnal

Date: Feb., 4, 2020

Organized by: Faculty of Agricultural Sciences, DAV University, Jalandhar and ICAR- Indian Institute of Wheat and Barley Research (ICAR- IIW&BR), Karnal

Name of organizer: Dr. (Prof.) Ravish Chatrath, Dean, Faculty of Agricultural Sciences

Brief Description of the Event:

Faculty members of Agricultural Sciences visited ICAR- IIW&BR, Karnal on Feb., 4, 2020 to interact with a team of scientists and to visit research farms and laboratories to see ongoing research activities. Dr Ravish Chatrath, Dean (Agri. Sciences) along with Dr. Ruhidas Ghatak (Agronomy), Dr. Pooja Rattan (Vegetable science) and Dr. Rupender Kamboj (Agricultural extension) interacted with Dr. R K Sharma, Dr. Gyanender Singh, Dr. Satyavir Singh, Dr. Sewa Ram, Dr. R. P. S. Verma, Dr. Sudhir Singh and Dr. Poonam Jasrotia. The scientists of the institute briefed on crop improvement activities with special reference to quality and value addition (Biscuit quality in wheat and fermented products from barley). They further explained the plant protection and extension activities in wheat and barley and planning, monitoring and coordination committees for smooth conduction of research within the mandate of ICAR, New Delhi. Later, the DAVU faculty visited the museum and research farm of the institute to further understand its history, development, projects and current research activities.

Photographs of the Event:

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Registrar
DAV University, Jalandhar

MEMORANDUM OF UNDERSTANDING

BETWEEN

PUNJAB ENERGY DEVELOPMENT AGENCY

&

DAV University, Jalandhar

FOR

Research & Development Projects on Energy Conservation & Energy Efficiency under "State Energy Efficiency Research & Outreach Program" of Bureau of Energy Efficiency, Ministry of Power, Government of India.

ATTESTED
Registrar
DAV University, Jalandhar

This MEMORANDUM OF UNDERSTANDING concluded on 4th day of December, 2019 between Punjab Energy Development Agency, Sector-33D, Chandigarh herein thereafter referred to as PEDA which expression shall where the context admits; include its successors or assignees represented by its Chief Executive Officer as the First Party

&

DAV University, Jalandhar herein thereafter referred as DAV University which expression shall where the context admits; include its successors or assignees represented by its Vice Chancellor as the Second Party

OBJECTIVES OF MOU

Bureau of Energy Efficiency (BEE) is the central agency for implementation of Energy Conservation Act, 2001 established under the Ministry of Power, Govt. of India. Punjab Energy Development Agency (PEDA) has been declared as the State Designated Agency to coordinate, regulate and enforce the Energy Conservation Act, 2001 in the state of Punjab under the guidelines of BEE. BEE has desired that PEDA may collaborate with the Educational / Research Institutes and Laboratories to encourage innovative projects and research in the field of energy efficiency and energy conservation under State Energy Efficiency Research and Outreach program.

The mission objective of this Memorandum of Understanding is to work on research on innovative projects in the field of energy efficiency / energy conservation as follows:

- Clean and energy efficient innovation technologies in Building Energy Efficiency, Energy Modeling and Simulation, Monitoring and Benchmarking of buildings, Net Zero energy buildings, Energy Efficient Building materials, Advanced HVAC and lighting technologies etc.
- Research and Development of clean and energy efficient technologies in Industries (MSMEs & Large), technology up-gradation to reduce/ optimize auxiliary power consumption and zero impact manufacturing.

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DAV University, Jalandhar

- Energy efficient equipment's/ appliances monitoring, testing and evaluation/ certification.
- Policy studies and initiatives on energy conservation, energy management and its implementation in various thrust areas i.e. domestic, commercial, agricultural, industrial, etc.
- To bridge the gap between theory and field through technical inputs at onsite locations.

It is further agreed;

- The institute will submit R&D proposal on energy conservation & energy efficiency to PEDA.
- The proposal should be submitted in the prescribed formats along with necessary documents as per the guidelines of Bureau of Energy Efficiency (BEE), Ministry of Power (MoP), Govt. of India (GOI), New Delhi.
- After reviewing, PEDA will submit the proposal to Bureau of Energy Efficiency for their comments and approval.
- Only upon getting the approval from BEE, the institute / researcher shall be permitted to carry out the research under the program on such terms and conditions laid down by BEE in this regard.
- The financial assistance/ funding of the proposal outlay shall be provided by BEE to PEDA which shall further be disbursed to the institute as per guidelines as well as terms & conditions of BEE.
- The role of institute is:
  - To publicize the program locally and ensure adequate participation.
  - To provide strategic research support, guidance and direction for the development of R&D projects.
  - Designing, Testing, Performance evaluation and analysis of different technologies.
  - To provide experts/ specialists/ faculties technical material and technical assistance in the concerned areas of technology.

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DAV University, Jalandhar

- To facilitate PEDA interaction through involvement of researcher through Educational / Research Institutes and Laboratories.
- Joint hosting of Conferences, Training Courses/ Workshops.

COMMUNICATION

Any communication or notice or intimation shall be addressed to signatories and such a communication sent by e-mail, tele-fax, registered/ air-mail shall be deemed to be sufficient. It is the responsibility of each organization that it keeps the other party updated of its contacts.

RESPONSIBILITIES

- PEDA will be the facilitating agency only. There will be no responsibilities / financial liability attributed to PEDA/ Punjab Govt under this MoU.
- The research institute shall be bound to meet with / fulfil all the conditions laid down by BEE under the program.
- Entering into this MoU doesn't confer any rights upon researcher / institute or approval in any manner to carry out the research under this program, as the same is subject to the approval of BEE, MoP, GOI.
- PEDA will not be liable to provide any financial support to the researcher / institute as the approval for R & D project has to be rendered by BEE, MoP, GOI.

JURISDICTION

In case of any disputes arises between the parties with regard to terms and conditions of this MoU or relating to the interpretation hereof, the same shall be referred to the Arbitration of a Sole Arbitrator in accordance with the provisions of the Arbitration and Conciliation Act, 1996 and rules made there under including any modifications, amendments and further enactments thereto. The venue for the arbitration will be at Chandigarh. The decision of the Arbitrator shall be final and binding on the parties. Subject to the arbitration clause above any dispute shall be referred to the exclusive jurisdiction of courts of Chandigarh.

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DAV University, Jalandhar

NON-EXCLUSIVITY

The relationship of the parties under this MOU shall be non-exclusive and both parties including their affiliates, subsidiaries and divisions, are free to pursue other related agreements or collaborations of any kind with mutual consent with or without limiting each party's right to collaborate on that subject.

OTHER TERMS AND TERMINATION

a. This MOU shall remain valid, unless until terminated by either of the parties by serving upon 30 days prior written notice to the other party.
b. However, such earlier termination of this MOU, whether mutual or unilateral, shall not have retrospective effect on any ongoing research / project activities or on any agreement entered under this MOU, till the completion of the ongoing research(s) / project (s).
c. In the event of termination of this MOU, assets, if any, created from the funding of the BEE/PEDA, shall be property of BEE/PEDA and institute shall hand over the created assets to authorized representative of PEDA within 30 days from the termination of this MOU / completion of ongoing activities as per their schedule.
d. The institute shall maintain stock registers for consumables / non-consumable stores under the activities funded under this MOU.

For and on behalf of
Punjab Energy Development Agency, Chandigarh

RAVI PAL SINGH RANDHAWA, IAS
CEO
Punjab Energy Development Agency
CHANDIGARH

Chief Executive Officer

Witness:

For and on behalf of
DAV University, Jalandhar

Vice Chancellor

Vice Chancellor
DAV UNIVERSITY
JALANDHAR

Witness:

ATTESTED
Registrar
DAV University, Jalandhar

Department of Electrical Engineering

Event Report

Name of Event:	Visit to Punjab Energy Development Agency, Chandigarh
Date:	06/09/2024
Organized by:	DAV University, Jalandhar
Name of Organizer:	Dr. Chetan Vasudeva, Dr. Ashutosh Bhadoria, Ms. Simran Kaur
Place of Visit:	Punjab Energy Development Agency, Chandigarh
No. of Participants:	21

Website Link:

https://www.peda.gov.in/#:~:text=Punjab%20Energy%20Development%20Agency%20was%20formed%20in%20Sept.%201991%20as

Brief Description of Event:

Students of Electrical Engineering visited Punjab Energy Development Agency(PEDA), Chandigarh. The students were given awareness about the initiatives being done by PEDA such as Promotion and Development of Small/Micro Hydel projects on canal falls, Biomass/Agro residue based power projects, Co-generation power project in Sugar Mills and Paper industry, Solar Photovoltaic and Solar thermal power projects, Waste to Energy projects, Solar Photovoltaic based technologies, Biomass based gasifiers, Solar thermal systems, Implementation of Energy Conservation Act, Biogas development programme through setting up large

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size Institutional/Night Soil based biogas plants and Family Size biogas plants, Energy conservation, Solar Passive Architecture, Creating Awareness & Publicity in masses to adopt Non-conventional Energy Sources and Energy Saving / Conservation. Students also visited the product display gallery in the premises also the PEDA building is being rated with 5 Star rating in Energy consumption by Bureau of Energy Efficiency(BEE).

List of Participants:

Sr. No.	Student Name	Regn. No
1	VAIBHAV	12400041
2	UPANSHU	12401098
3	MOHIT	12401587
4	ADITYA	12402057
5	JASPREET SINGH	12300260
6	K SUSHMITA	12300443
7	ARYAN KATNORIA	12300912
8	SUKHCHAIN SINGH	12301226
9	HARMAN BAINS	12402243
10	ASHISH	12200158
11	AKASHDEEP SINGH BHATTI	12201437
12	BIBHAKAR	12300270
13	DIVYA	12300331
14	DIKSHA	12300876
15	VISHAL	12100215
16	DHARAM PREET SINGH	12100229
17	DEEPAK KUMAR	12100230
18	KULVIR SINGH	12100625
19	HIMESH KUMAR	12100661
20	ARYAN THAKUR	12100977
21	JATIN SINGH	12101014

Programme Schedule:

Departure from University: 8:00AM

Arrival at PEDA: 11:30AM

Return to University: 8:30PM

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Registrar

DAV University, Jalandhar

Complex, Plot No. 1&2, Sector-33D, Sector 33, Chandigarh, 160020

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DAV University, Jalandhar

Department of Mechanical Engineering

Event Report

Name of Event:	PEDA organizes training programme at DAV University on energy conservation
Date:	5-7, September 2018
Organized by:	DAV University, Jalandhar
Name of Organizer:	Dr. Rajesh Khanna
Venue:	DAV University,Jalandhar

Website Link:

https://www.davuniversity.org/news/peda-organises-training-programme-at-dav-university-on-energy-conservation-251

Brief Description of Event:

Various experts discussed the modalities for achieving optimum performance in institutional and commercial buildings for conserving energy at a training programme held at DAV University. The three-day training programme was organized by Punjab Energy Development Agency (PEDA) with the support of Bureau of Energy Efficiency (BEE) and UNDP. The experts said that ECBC specified the energy performance requirements for all commercial buildings which must be adhered to. Following ECBC would ensure the construction of energy efficient buildings reducing electricity demand by up to 40 percent.

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DAV University, Jalandhar

The training programme was inaugurated by Prof Rakesh Kumar Mahajan, Vice-Chancellor, DAV University. He said that every individual should optimise the use of energy to help the government's initiative effective.

Mr Randhir Singh, Senior Manager highlighted the initiatives of PEDA in energy conservation. BEE empanelled Energy Conservation Building Code (ECBC) Master Trainers Mr Kushagra Juneja and Mr Money Khanna also talked about energy conservation through proper structure design.

Dr Rajesh Khanna, Coordinator, University-Industry Linkage Cell, talked on the energy efficiency using Taguchi method evolved in Japan. Dr Khanna also deliberated on the steps taken by the university.

Mr Mandeep Singh from the Public Works Department (PWD) highlighted the working of lighting simulation software to conserve electricity. The simulator facilitates proper lighting design in buildings.

Those present at the programme included Dr Sushma Arya, Registrar, Dr. Desh Bandhu Gupta, Dean (Academics) and Dr. Jasbir Rishi, Dean Students' Welfare (DSW).

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Certificate of Participation

Mr. / Ms. Dr. Chetan Vasudeva

from D.A.V. University

has participated in the

Three Days Capacity Building Training Program on

Punjab Energy Conservation Building Code (Punjab ECBC)

held on

5th – 7th Sept, 2018 at DAV University, Jalandhar

Organised by Punjab Energy Development Agency in association with

Design2Occupancy Services LLP.

ECBC Master Trainer

Design2Occupancy Services LLP

Punjab Energy Development Agency

Dr. Chetan Vasudeva attended Capacity Building Programme under Municipal Demand Side Management - 05th June 2020 - 11:00 AM – organized by PEDA

CERTIFICATE OF ATTENDANCE

WE HEREBY CERTIFY THAT

Chetan Vasudeva

has attended the Webinar on
"One Day Capacity Building Programme under
Municipal Demand Side Management"
organized by PEDA, BEE and supported by D2O
on June 5, 2020

MP SINGH
Director
Punjab Energy
Development Agency

ARIJIT SENGUPTA
Director
Bureau of Energy
Efficiency

KUSHAGRA JUNEJA
Managing Partner
Design2Occupancy
Services LLP

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Registrar
DAV University, Jalandhar

ICAR-Central Soil Salinity
Research Institute, Karnal (Haryana)

DAV University
Jalandhar, Punjab

A MEMORANDUM OF UNDERSTANDING FOR COLLABORATION FOR POST-GRADUATE RESEARCH

Between

ICAR-CENTRAL SOIL SALINITY RESERCH INSTITUTE (Karnal, Haryana)

And

DAV UNIVERSITY, (Jalandhar, Punjab)

ICAR-Central Soil Salinity Research Institute, Karnal - 132001, Haryana, India is a premier research institute dedicated to pursue interdisciplinary research on salinity/ alkalinity management and use of poor quality irrigation waters in different agro-ecological zones of the country. The organization was established in 1969 at Karnal. The Institute has grown into an internationally recognised esteemed centre of excellence in salinity research. Multidisciplinary research activities at the main institute are being strengthened through four research divisions viz., Division of Soil and Crop Management, Division of Irrigation and Drainage Engineering, Division of Crop Improvement and the Division of Technology Evaluation and Transfer. The Institute has developed technologies for the reclamation of alkali soils with the addition of chemical amendments, reclamation of saline soils through subsurface drainage, development and release of salt tolerant crop varieties of rice, wheat and mustard and the land shaping technologies for the reclamation of waterlogged inland and coastal salt affected soils The Institute has also developed Post Graduate Education programme in association with State Agricultural Universities (SAUs), Indian Institute of Technology (IIT) and other Universities, which has contributed to the growth of the Institute substantially.

At present the institute has a scientific staff /positions with specializations in Agronomy, Soil science, Plant Breeding, Agroforestry, Microbiology, Horticulture, Plant Physiology, Agricultural extension and Agricultural Economics. These scientists are well trained in their field in India and

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DAV University, Jalandhar

abroad. There are several prestigious national and international collaborative projects ongoing at the ICAR-CSSRI. The institute has well-equipped laboratories having most modern scientific instruments/facilities. The institute has excellent physical and technical facility for doing research on amelioration of salt affected soils. It is, therefore, proposed to extend collaborative efforts with DAV University (Jalandhar, Punjab) which is having adequate facilities in post graduate teaching and research.

Understanding the scope of participation in this program, the DAV-U, hereafter refer to as the collaborating University and the ICAR-Central soil Salinity Research Institute, Karnal hereafter refer to as ICAR-CSSRI of the Indian Council of Agricultural Research, sign the memorandum of understanding (MOU) for jointly undertaking the post-graduate education/research program, in the above mentioned disciplines with the following terms and conditions and agree to carry out their respective responsibilities as detailed in the MOU.

Terms and conditions

1. The following terms and conditions will be applicable to both the collaborating University and ICAR-CSSRI, as specified in the sub clauses below:

   1.1 The yearly programme of admission, number of seats in each subject, PG teaching, student's accommodation in the hostels, area of research etc. will be the responsibility of the collaborating University and shall be as per the university rules & policies.

   1.2 The degree will be awarded by the DAV-U.

   1.3 If the major advisor of the PG student feels that Faculty or facilities of the ICAR-CSSRI may be helpful in the student's research, the collaboration of ICAR-CSSRI may be sought.

   1.4 Any scientist of ICAR-CSSRI fulfilling the qualifications/requirements of PG teachers of DAV-U, on the recommendation of the Director, ICAR-CSSRI may be appointed as major / co-major advisor in the advisory committee of the student as per mutual agreement with the competent authority of the University depending upon the topic of research for thesis and time sharing. ICAR-CSSRI will permit the concerned scientist to act as major / co-major advisor (Co-Guide) of the student.

   1.5 The nature of the research undertaken by the student(s) will be preferably related to interdisciplinary research work on soil science, agronomy, horticulture, genetics and plant breeding etc. and will be agreed to by the student's advisory committee and concerned competent authority of the university.

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Registrar
DAV University, Jalandhar

1.6 Such student will be allowed to utilize the scientific material and physical facilities of ICAR-CSSRI with proper approval of the concerned authorities.

1.7 The ICAR-CSSRI would also provide facilities required for research by any other Faculty Member/student of above mentioned disciplines (Clause 1.5) on reciprocal basis provided it does not hinder the natural functioning of the University.

1.8 The help rendered by ICAR-CSSRI will be properly acknowledged in the thesis and any research paper/other publication/award emerging out of the research work carried out by the students in collaboration with ICAR-CSSRI will be jointly shared. The concerned student will be the first author and major/co-guide from CSSRI will be the corresponding author. All the IPR will rest with ICAR-CSSRI, if the research work is carried out at ICAR-CSSRI. In the event of equal amount of work being carried out at both ICAR-CSSRI and the university, patents/protections/knowledge generated will be shared in proportion as per mutually settled terms by ICAR-CSSRI and DAV-U.

1.9 Student/ faculty from DAV-U will not share any genetic material with any third party without the specific approval of ICAR-CSSRI.

1.10 Charges for the student research will be governed by the ICAR rules and laws at any time.

1.11 Student has to bear all boarding and lodging charges during the period of his/her stay at ICAR-CSSRI.

1.12 Submission of NOC from ICAR-CSSRI will be the mandatory requirement before the award of degree by the university to the concerned student.

1.13 The ICAR-CSSRI/Collaborating University will abide by the rules and regulations of the respective organizations.

1.14 All questions/issues related to this MoU shall be settled amicably by both parties and disagreement if any shall be forwarded for settlement by arbitrator of mutual acceptance.

ATTESTED
Registrar
DAV University, Jalandhar

Executed this 04th day of February, 2020 for a period of 5 years, and further extendable with the consent of both the parties.

In Witness Whereof, the authorized representatives of both parties have hereunto affix their signature below:

For the

ICAR-Central Soil Salinity Research Institute

Director

निदेशक/Director
भा.कृ.अनु.प.–केन्द्रीय मृदा लवणता अनुसंधान संस्थान
ICAR- Central Soil Salinity Research Institute
करनाल–132001/ Karnal-132001

Vice Chancellor, DAV U

Vice Chancellor
DAV UNIVERSITY
JALANDHAR

Signed in the presence of

Coordinating Scientist

ICAR-Central Soil Salinity Research Institute

Karnal. Haryana-132 001

प्रभारी अधिकारी/Officer-in-Charge
पी.एम.ई./PME Cell
भा.कृ.अनु.प.–केन्द्रीय मृदा लवणता अनुसंधान संस्थान
ICAR-Central Soil Salinity Research Institute
करनाल–132001 (हरियाणा)/Karnal-132001 (Haryana)

Dean,

Faculty of Agricultural Sciences

DAV U, Jalandhar

DEAN
Faculty of Agriculture Sciences
DAV University, Jalandhar

Registrar

Registrar
JALANDHAR

ATTESTED

Registrar
DAV University, Jalandhar

Faculty of Agricultural Sciences
DAV University, Jalandhar

Event Report

Name of the event: Visit to CSSRI, Karnal and interaction with scientists

Date: Feb., 4, 2020

Organized by: Faculty of Agricultural Sciences, DAV University and Central Soil Salinity Research Institute

Name of organizer: Dr. Ravish Chatrath, Dean (Agri. Sciences), DAV University, Jalandhar

Brief Description of the Event:

The faculty members of Agricultural Sciences visited Central Soil Salinity Research Institute on Feb., 4, 2020 to interact with the scientists of the institute. A team of four faculty members, Dr. Ruhidas Ghatak (Agronomy), Dr. Pooja Rattan (Vegetable science) and Dr. Rupender Kamboj (Agricultural extension) with Dr Ravish Chatrath, Dean (Agri. Sciences) visited the research farms and laboratories of the institute. They interacted with scientists of different disciplines working on salt stress tolerance and facilities created in the institute for the screening and identification tolerant lines and salt stress management practices recommended by the institute.

Event photographs

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Registrar
DAV University, Jalandhar

Department of Science, Technology & Environment, Government of Punjab

DAV University, Jalandhar

Memorandum of Understanding

This Memorandum of Understanding (MoU) is entered into on the 16 day of October, 2019 at Chandigarh.

Between

The Department of Science, Technology & Environment, Government of Punjab, Chandigarh (hereinunder referred to as 'DSTE-GoP' which expression shall where the context so admits include its successors and permitted assigns) of one part.

And

DAV University, Jalandhar (hereinafter referred to as 'DAV University' which expression shall where the context so admits include its successors and permitted assigns) of the other part.

Whereas, the Parties recognize the need to jointly address the issues of state importance pertaining to the environment, climate change and public health to achieve the overall goals and objectives of newly launched Mission Tandrust Punjab 2.0.

And whereas, the Parties recognize the need for promoting Research and Innovation (R&I) ecosystem in the State and particularly using Research and Innovation to enhance competitiveness, boost economic growth and create quality jobs.

And whereas, the Parties have expressed the desire to work together to promote collaborative programmes to make Punjab the R&I Hub and the healthiest State with healthy environment so as to enhance the adaptive capacity and resilience of the State towards emerging challenges.

In witness whereof the Parties now agree to the following :

ATTESTED

Registrar
DAV University, Jalandhar

Article-1 : Broad areas of Cooperation

1. The DSTE-GoP and DAV University, Jalandhar have identified the following areas of mutual interest for cooperation:

(i). Partnership to undertake state specific collaborative research & innovative programs in the areas of Environment, Public Health and Life Sciences.
(ii). To develop and promote model village in terms of air, water & soil quality, waste management, rain harvesting, zero burning of paddy straw, etc. and to replicate the initiative in other villages.
(iii). Jointly organize Innovation Summits/Conclaves, capacity building & awareness programmes to promote research and innovation in the State.
(iv). Any other area of cooperation that may be mutually agreed upon.

2. The DSTE-GoP and DAV University, Jalandhar have jointly identified above said areas for both short and long-term collaboration and will continue to identify additional actions, as required from time to time. The scope of work, financial implications, source of funds, terms of reference & time lines would be determined and mutually agreed to, on a case to case basis.

3. Both Parties will jointly identify financial resources and facilitate implementation of mutually identified activities.

4. Without prejudice to their endeavours to work together, both the Parties shall be free to work independently with other organizations as well, in the areas of mutual cooperation as identified in Para 1 above.

5. Neither Party shall incur any liability, financial or otherwise, on behalf of the other party, without prior written consent of the other Party.

6. The DSTE-GoP and DAV University, Jalandhar may decide mutually all other matters and activities that have not been specially mentioned or provided in the MoU.

Article-2 : Validity

This MoU shall be valid for FIVE years from the date of its execution. However, agreements concluded under this MoU shall be valid till the end of contracting obligations and responsibilities of the concerned Parties. The validity of this MoU can be further extended with the mutual consent of the Parties in writing.

Article-3 : Termination

This MoU can be terminated by either party by serving one month notice in writing, without assigning any reason, subject to completion of assignments in hand.

ATTESTED

Article-4 : Governing Law

Laws of India shall govern the MoU.

Article -5 : Arbitration

That the disputes, if any, shall be subject to arbitration if mutual consultations between the parties i.e. DAV University, Jalandhar and Department of Science, Technology & Environment, Government of Punjab, Chandigarh, fail to resolve the issue. The arbitration shall be strictly in accordance with the Arbitration Act as amended from time to time. That the jurisdiction in the event of disputes arising out of the terms of the agreement shall be Jalandhar/Chandigarh court.

In witness thereof, the undersigned duly authorized thereto have signed this Memorandum of Understanding.

R.K. Verma, IAS
Principal Secretary
Department of Science, Technology
Environment, Govt. of Punjab

Desh Bandhu Gupta
Vice-Chancellor
DAV University, Jalandhar

Witnesses:

1. Executive Director, Punjab State Council for Science & Technology.

2. Dr Tarsem Rishi, Dean Student welfare, DAV University, Jalandhar.

ATTESTED
Registrar
DAV University, Jalandhar

Ref. No.

12/10/19

Mr. Bhag Ram
Sarpanch.

Village Sangowal, VPO-Kishangarh, Jalandhar, Punjab

Subject: Consent for the model development of Village Sangowal

This is with reference to the letter received from VC office, DAV University (Ref. No. VC/DAVU/2019/020 dated 27/09/2019) through Dr. Rahul Kumar, Assistant Professor, DAV University. I appreciate the initiative by DAV University and Punjab Research Innovation by Punjab Council of Science and Technology and Environment for selecting our village for the model development for the Mission Tandrust Punjab. On behalf of Village Panchayat, It will be my pleasure to welcome and work with DAV University and the mission for the model development of Village Sangowal.

Sincere Regards and thanks

Bhag Ram
12/10/19
Sarpanch
Gram Panchayat Sanghwal
Tehsil & Distt. Jalandhar

To

VC Office, DAV University, Jalandhar.

ATTESTED
Registrar
DAV University, Jalandhar

DAV UNIVERSITY

Office of the Vice-Chancellor

+91-181-270 8844 Telephone
vc@davuniversity.org E-mail
+91-181-270 8844 Fax
www.davuniversity.org Website

Ref. No. VC / DAVU / 2019 / 020 Dated 27.09.2019

The Sarpanch
Sangwal Village
Jalandhar

Dear Sir,

It gives me immense pleasure to inform you that the discussion held between DAV University and people representatives of Sangwal Village has fructified and authorities have agreed to work in your village to make it as model village in terms of air, water & soil quality, waste management, rain harvesting, zero burning of paddy straw, etc.

This proposal of adopting your village is a result of efforts made by the Punjab Council of Science, Technology and Environment under the Mission Tandrust Punjab. DAV University in association with Punjab Research Innovation will try to make all efforts to make Sangwal Village as a Model Village with the cooperation of Gram Panchayat. The details of the initiatives to be taken shall be mutually decided by DAV University and the village people.

You are, therefore, requested to send your acceptance to this piece of information so that an agreement to this effect is prepared for further necessary action.

Thanking you.

Yours sincerely,

27/9/19

(Prof. Desh Bhandu Gupta)
Offg. Vice Chancellor

ATTESTED

Registrar
DAV University, Jalandhar

Recieved by Sarpanch & Panchayat

Bhag Ram

Sarpanch
Gram Panchayat Sanghwal
Tehsil & Distt. Jalandhar

DEPARTMENT OF BOTANY
UNIVERSITY OF KASHMIR

NAAC ACCREDITED GRADE "A+"

NORTH CAMPUS, DELINA, BARAMULLA (J&K)-193103

Website: northcampus.uok.edu.in **Email:** coordinatorbotnc@uok.edu.in

TO WHOM IT MAY CONCERN

This is to place on record that Dr.Ashutosh Sharma, Associate Professor, Faculty of Agricultural Sciences, DAV University Jalandhar is Collaborating with me on various research and academic collaborations from 2019 to till date, in the area of Plant Biology. We are working together on many innovative research ideas, which are continuously being published in the form of the research papers and book chapters etc.

Dr. Bilal Ahmad Mir
Assistant Professor & Coordinator

ATTESTED
Registrar
DAV University, Jalandhar

Chapter 14
PGPR and Earthworm-Assisted Phytoremediation of Heavy Metals

Pooja Sharma, Palak Bakshi, Jaspreet Kour, Arun Dev Singh, Shalini Dhiman, Pardeep Kumar, Ibrahim, Ashutosh Sharma, Bilal Ahmad Mir, and Renu Bhardwaj

Abstract The pronounced and major effects of contamination of the environment with heavy metals and other xenobiotic compounds have become a major problem worldwide. Soil contaminated with heavy metals poses serious threat to plants, animals as well as human health. Heavy metals due to their toxicity reduces the soil fertility, affects the plant photosynthetic efficiency, reduces yield of the crops, and causes nutrient imbalance. Phytoremediation an eco-friendly, clean, and green technology helps to remove contaminants from the polluted soils. The use of beneficial microorganisms along with plants is considered as an effective method for increasing the efficiency of remediation of contaminated soils. Earthworms also play an important role in remediation process. Interaction of plants with microflora plays a vital role in bioavailability of the metals and their bioaccumulation in plants.

Keywords Plant growth-promoting rhizobacteria · Earthworms · Fungi · Heavy metal · Plants

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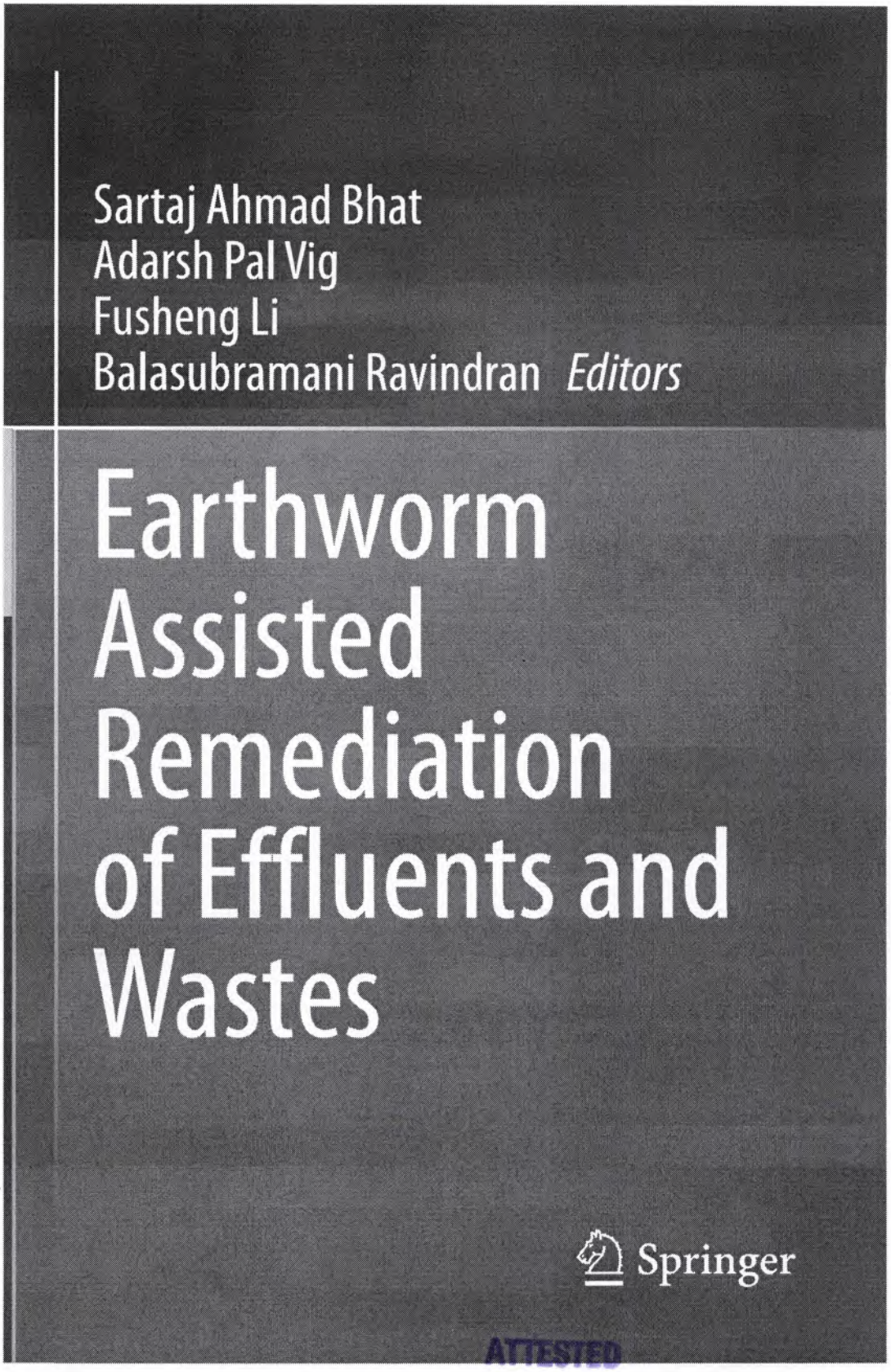

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Chapter 15 - Hydrogen sulfide and phytohormones crosstalk in plant defense against abiotic stress

Jaspreet Kour [1], Kanika Khanna [1], Pooja Sharma [1 2], Arun Dev Singh [1], Indu Sharma [3], Priya Arora [1], Pardeep Kumar [1], Kamini Devi [1], Mohd Ibrahim [1], Puja Ohri [4], Bilal Ahmad Mir [5], Ashutosh Sharma [6], Renu Bhardwaj [1]

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Global developmental strategies and population expansion are continuously showing their odd impacts on the living world, thereby causing stresses of multiple natures. To combat these stresses, hydrogen sulfide (H_2S) is well-examined signaling molecule that acts as a priming agent and helps in regulating the response of plants to various stressful conditions. Hydrogen sulfide is formed in the plant cells as an intermediate of an assimilatory sulfate reduction. Despite the endogenous release of hydrogen sulfide, its exogenous application has been found to be beneficial in the amelioration of multiple abiotic stresses. These responses are also mediated by the expression of genes and proteins that participate in signaling and metabolic pathways induced through several small signaling molecules known as plant hormones or phytohormones. Phytohormones are also found to be involved in regulation of the protective responses under various abiotic and biotic stress conditions. H_2S in crosstalk with these phytohormones significantly ameliorates the abiotic stress in plants. In this chapter we have discussed in detail how H_2S in crosstalk with phytohormones helps in the enhancement of defense against abiotic stress in plants.

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19.1 Introduction

Heavy metals occur naturally in the soil, however a large amount of these metals are released to the environment by various geological and anthropogenic activities like rapid industrialization, extensive use of pesticides and fertilizers in agricultural lands, mining, smelting, sewage sludge [1]. Owing to their long persistence and nondegradable nature, their accumulation has sheer increased in agricultural soils and environment. Heavy metals are toxic to the cells even at genetic level by causing various mutations, consequently prove toxic to plants, animals, contaminate food chains and food webs [2, 3]. Some of the heavy metals like Fe, Zn, Ni, Co, Mn, Cu, Mo are essential micronutrients for various metabolic processes of plants but their excessive amounts are harmful. Metals such as As, Cd, Cr, Hg and Pb are not beneficial for the plant and alter the physiological and biochemical metabolism of the plants which eventually result in reduced crop yield [4, 5]. Exposure of plants to heavy metals cause oxidative stress due to excessive production of reactive oxygen species (ROS) such as superoxide (O_2-), hydroxyl radical (OH-), singlet oxygen ($1O_2$), and hydrogen peroxide (H_2O_2) Ojuederie and Babalola [6].

Among different strategies adopted by plants to overcome stress, various evidences have emerged which focus on the number of non-protein and protein thiols to combat stress [7]. The sulfur-containing amino acids cysteine (Cys), methionine (Met), the tripeptide glutathione play important role in abiotic stress tolerance [8]. Thiols work as redox buffer and protect the components of cells from ROS and play important role in plant adaptation to stress. Plants have large range of reduced sulfur in the form of protein thiols or low molecular weight (LMW) thiols present in the biomolecules like proteins, vitamins, antioxidants, cofactors, and metal binding proteins. Plants take up the sulfur from the soil in the form of sulfate which is reduced to sulfide and finally incorporated into cysteine. It is quickly incorporated in proteins or transformed into other compounds primarily methionine (Met) and glutathione (GSH). Thiol group (-SH) incorporated either in proteins (cys-residues) or its existence as non-protein thiol tends to be oxidized forming disulphides (S-S). This disulphide status in proteins is of utmost importance as

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Chapter 18

Nanobioremediation: a novel technology with phenomenal clean up potential for a sustainable environment

Tamanna Bhardwaj[1], Kanika Khanna[1], Pooja Sharma[1,2], Palak Bakshi[1,3], Kamini Devi[1], Isha Madaan[4], Shruti Kaushik[4], Geetika Sirhindi[4], Bilal Ahmad Mir[3], Rupinder Kaur[5], Ashutosh Sharma[6], Puja Ohri[7] and Renu Bhardwaj[1]

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18.1 Introduction

Nanobioremediation is a contemporary consolidated technology which includes both nanotechnology and bioremediation. It has got best of both technologies which makes nanobioremediation highly efficient and environment friendly approach (Singh et al., 2020). Toxicity of Nanoparticles for microorganisms is very well cited in the literature, but the right dose of nanoparticles plays critical role (Li et al., 2010). It was reported by Le et al. (2015) that with the help of nano-bio approach, polychlorinated biphenyls (PCBs) were effectively bioremediated with *B. xenovorans* and Pd/Fe nanoparticles. Another similar study conducted by Němeček et al. (2016), stated that nZVI and whey generated microbes removed 97%–99% of Cr (VI) in an integrated system. On basis of the sequence for applying the nanoparticle and bioagent, mainly two methods are designed namely sequential method and concurrent or combined method. In sequential method, contaminant is first treated with nanoparticles followed by bioagent. Whereas, in concurrent or combined method both the components i.e., bioagent and nanoparticles are added simultaneously (Singh et al., 2020). Biogenic nanoparticles are synthesized from Algal, Fungal and Bacterial agents. They are synthesized using intracellular or by extracellular processes. In intracellular processes, diffusion of positively charged metal ions takes place into negatively charged cell wall by electrostatic interactions. While in extracellular processes, enzymes secreted by fungus convert metal ions into metal nanoparticles (Menon et al., 2017). In another study, Sundaram et al., 2012 reported production of iron oxide nanoparticles by *Bacillus subtilis*, isolated from rhizosphere soil samples. Similarly, Menon et al. (2017) stated that fungal cells are capable of producing gold nanoparticles (AuNPs). Brown algae are engaged in biosynthesis of nanoparticles, since it is rich in mucilaginous polysaccharides and carboxyl groups. They assist in metal uptake and hence are used for production of nanoparticles (Khandel and Shahi, 2016). Microorganisms being biological entity, serves as a cost-effective renewable source for environmental remediation (Narayanan and Sakthivel, 2011). Various laboratory-based studies and field-level application of biogenic nanoparticles are conducted to clear away environmental toxins. Microbe mediated nanobioremediation is used to target heavy metals, hydrocarbons, dyes, pharmaceuticals as they adversely pollute natural resources. In recent study, it was reported that iron nanoparticles synthesized from natural consortium had ability to efficiently absorb copper, zinc and chromium from wastewaters (Castro et al., 2013). Biogenic manganese oxides (BMO) were manufactured using *Pseudomonas putida* MnB1 for eradication of heavy metals. Zhou et al., 2015 reported that BMO adsorbed heavy metals better than the chemically synthesized manganese oxide. Aziz et al., 2015 stated that biogenic AgNPs (silver nanoparticle) synthesized using *Chlorella pyrenoidosa* productively degrades Methylene blue (MB) dye, an obstinate toxic organic compound. Another study came up

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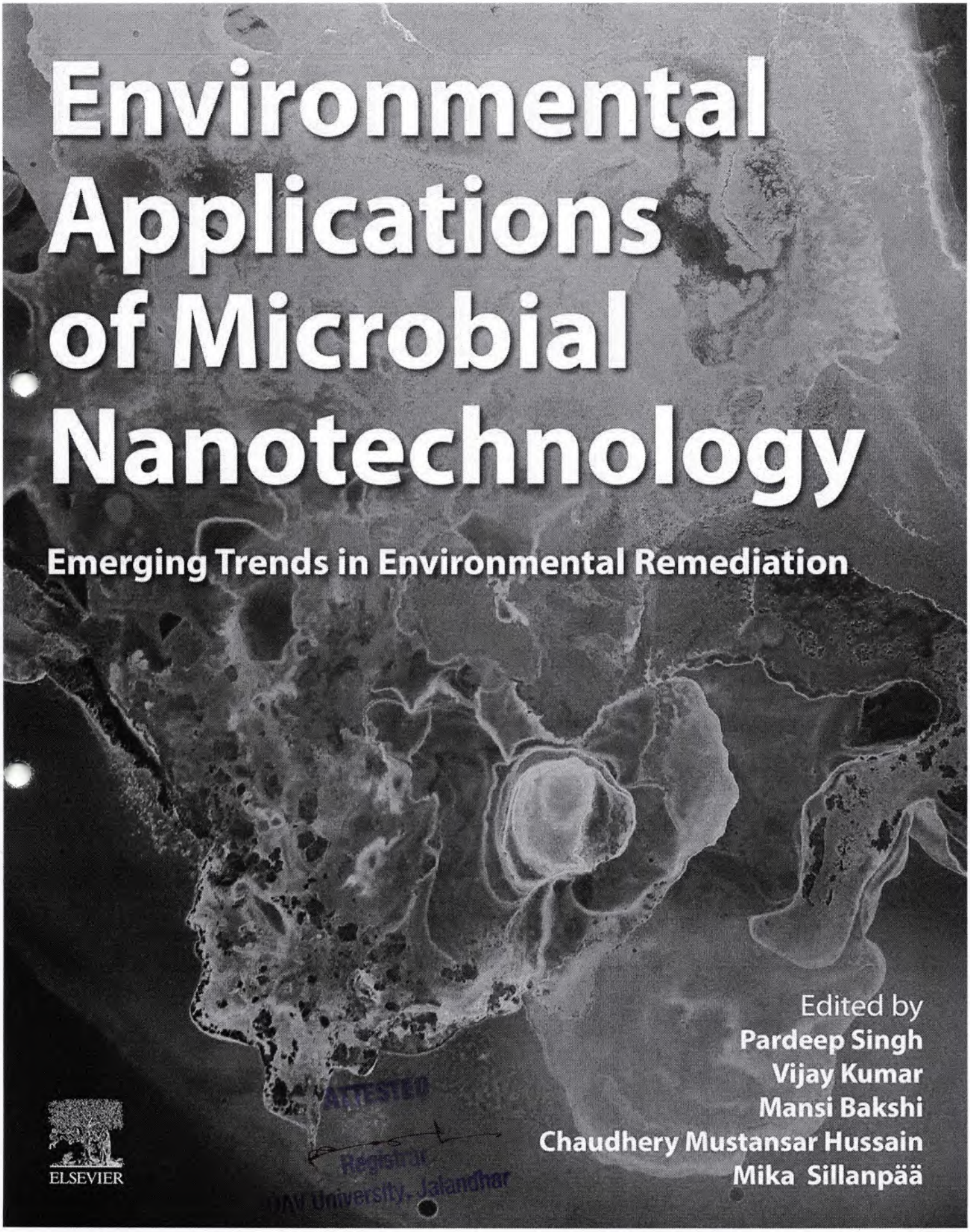
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Inapt usage of pesticides adversely affects the growth and development of the plants. Pesticides not only target the target species but also hampered the life cycle of nontarget species. The oxidative burst in plants with the generation of enhanced reactive oxygen species (ROS) has a detrimental effect on various physiological and biochemical mechanisms of plants which resulted in stunted growth, chlorosis, blackening of roots, accumulation of pesticides in plant parts, and decreased photosynthetic potential. Plants have the potential to withstand the stress conditions by activating different defense mechanisms like antioxidative defense system—enzymatic and nonenzymatic. Brassinosteroids (BRs) are the plant steroidal hormones known for their potential to

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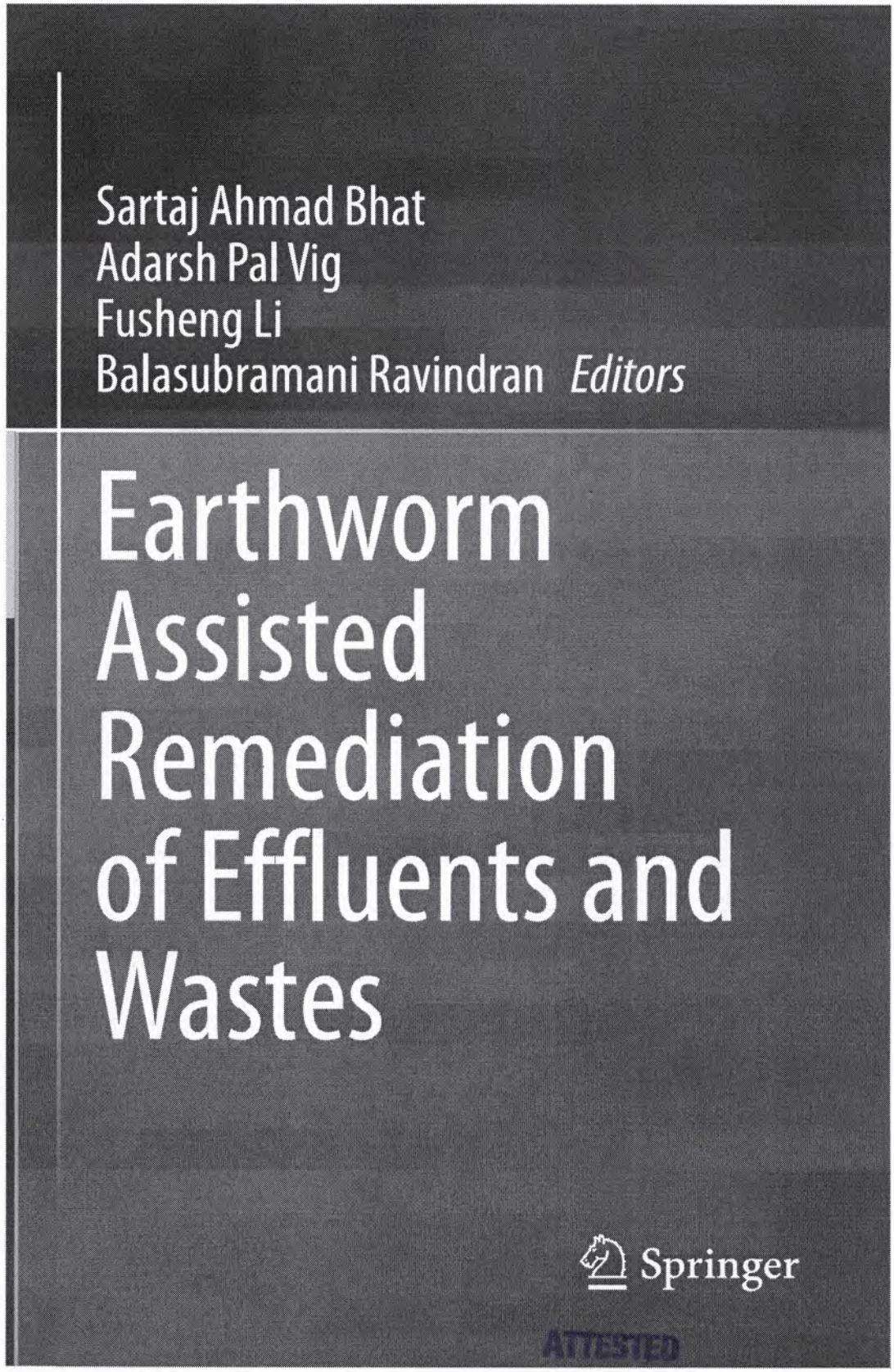

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Chapter 18

Nanobioremediation: a novel technology with phenomenal clean up potential for a sustainable environment

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18.1 Introduction

Nanobioremediation is a contemporary consolidated technology which includes both nanotechnology and bioremediation. It has got best of both technologies which makes nanobioremediation highly efficient and environment friendly approach (Singh et al., 2020). Toxicity of Nanoparticles for microorganisms is very well cited in the literature, but the right dose of nanoparticles plays critical role (Li et al., 2010). It was reported by Le et al. (2015) that with the help of nano-bio approach, polychlorinated biphenyls (PCBs) were effectively bioremediated with *B. xenovorans* and Pd/Fe nanoparticles. Another similar study conducted by Němeček et al. (2016), stated that nZVI and whey generated microbes removed 97%–99% of Cr (VI) in an integrated system. On basis of the sequence for applying the nanoparticle and bioagent, mainly two methods are designed namely sequential method and concurrent or combined method. In sequential method, contaminant is first treated with nanoparticles followed by bioagent. Whereas, in concurrent or combined method both the components i.e., bioagent and nanoparticles are added simultaneously (Singh et al., 2020). Biogenic nanoparticles are synthesized from Algal, Fungal and Bacterial agents. They are synthesized using intracellular or by extracellular processes. In intracellular processes, diffusion of positively charged metal ions takes place into negatively charged cell wall by electrostatic interactions. While in extracellular processes, enzymes secreted by fungus convert metal ions into metal nanoparticles (Menon et al., 2017). In another study, Sundaram et al., 2012 reported production of iron oxide nanoparticles by *Bacillus subtilis*, isolated from rhizosphere soil samples. Similarly, Menon et al. (2017) stated that fungal cells are capable of producing gold nanoparticles (AuNPs). Brown algae are engaged in biosynthesis of nanoparticles, since it is rich in mucilaginous polysaccharides and carboxyl groups. They assist in metal uptake and hence are used for production of nanoparticles (Khandel and Shahi, 2016). Microorganisms being biological entity, serves as a cost-effective renewable source for environmental remediation (Narayanan and Sakthivel, 2011). Various laboratory-based studies and field-level application of biogenic nanoparticles are conducted to clear away environmental toxins. Microbe mediated nanobioremediation is used to target heavy metals, hydrocarbons, dyes, pharmaceuticals as they adversely pollute natural resources. In recent study, it was reported that iron nanoparticles synthesized from natural consortium had ability to efficiently absorb copper, zinc and chromium from wastewaters (Castro et al., 2013). Biogenic manganese oxides (BMO) were manufactured using *Pseudomonas putida* MnB1 for eradication of heavy metals. Zhou et al., 2015 reported that BMO adsorbed heavy metals better than the chemically synthesized manganese oxide. Aziz et al., 2015 stated that biogenic AgNPs (silver nanoparticle) synthesized using *Chlorella pyrenoidosa* productively degrades Methylene blue (MB) dye, an obstinate toxic organic compound. Another study came up

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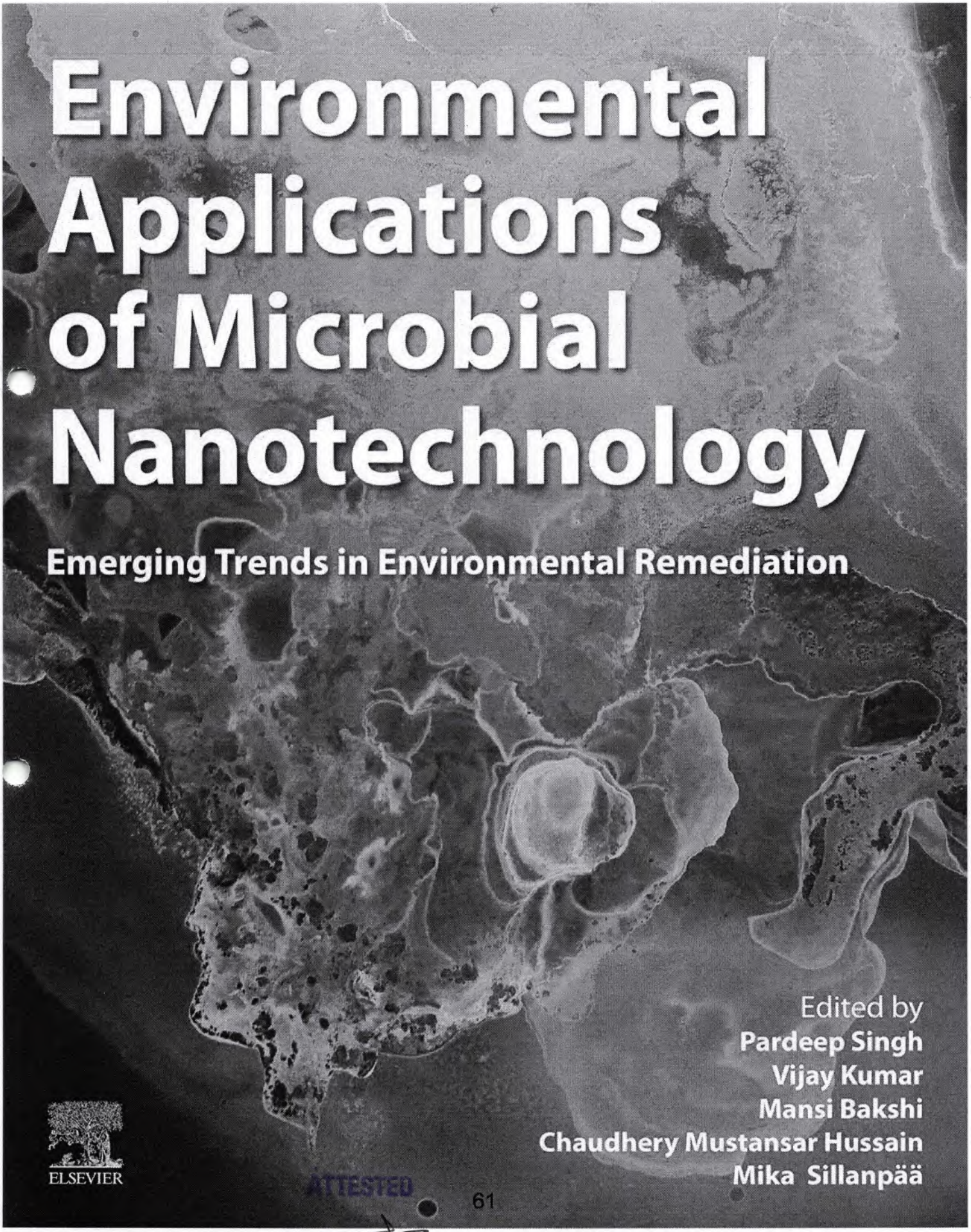

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To Whom IT May Concern

It is certified that Dr. Daljit Kaur, Faculty member of Physics Department, DAV University Jalandhar, is collaborating with me on various research problems of nanomaterials from 2019 to the till date. We are working together on many complex nanocomposites and hybrid materials for photocatalytic applications.

Manika Khanuja
18/04/2024.

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Research Papers

Enhanced photocatalytic degradation of Rhodamine B and Methylene blue by novel TiO_2/SnSe-SnO_2 hybrid nanocomposites under sunlight irradiation: Correlation of photoluminescence property with photocatalytic activity

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ARTICLE INFO

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ABSTRACT

Semiconducting nanocomposites (NCs) has proved their dominance in various energy applications. The facile chemical synthesis of semiconducting hybrid NCs of TiO_2 nanoparticles with SnSe/SnO_2 (SS) nanostructures has been carried out. Structural, morphological, compositions, optical and photo-catalytic (PC) properties of the synthesized materials were then studied by various characterization techniques. The hybrid NC of TiO_2 nanoparticles grown with addition of 0.5 g of SS nanostructures has been observed to exhibit the best PC activity among the other samples. The fitted photoluminescence (PL) spectra of pristine TiO_2 when compared with the other two TiO_2 -SS hybrid NCs showed that the oxygen vacancy (OV) defects play a major role in enhancing the PC property. The samples with superior PC activities have higher intensity of PL emission peak from OVs, efficient charge separation owing to longer lifetime of free charge carriers deduced from time-resolved PL studies and higher surface area.

1. Introduction

The toxicity and hazardous chemicals in water from last few decades has attracted attention towards the increasing environmental pollution in various parts of the world. Mainly dyes are responsible for water pollution that is used in food, textiles, cosmetics, leather industries etc. There are various methods used for the degradation of dyes like chemical, oxidation, chemical ion exchange, coagulation- flocculation, electrocoagulation, electrooxidation, vacuum evaporation, membrane filtration photocatalysis and absorption [1–7]. Photocatalysis is a highly efficient cost-effective method that degrades these toxic pollutants to harmless minerals using green and abundant solar energy on the surface of a photocatalyst [8–11]. An efficient photocatalyst must have an optimum band gap value, slow charge recombination and high surface area to facilitate the photocatalysis process [12–14]. The photocatalysts are generally semiconductor materials that absorb light radiation to produce electron-hole pair which helps in formation of free radicals that are responsible for oxidation of long-chain organic molecules. Titanium dioxide has become one of the best choices as photocatalyst because of its low cost, high chemical stability, good oxidizing power, non toxic nature and good photocatalytic efficiency. TiO_2 is used in various applications such as photo catalysts, photovoltaics, photosensors, paints, toothpaste, ointments, sun screen, self cleaning surface, water splitting, water purification, air cleaning, solar cell and batteries [15,16]. TiO_2 could absorb the light of wavelengths lower than 387 nm due its large band gap (3.0 – 3.5 eV). It absorbs light only in ultraviolet region and only small fraction of solar light can be absorbed by TiO_2 as less than 5% of solar energy is emitted as UV irradiation. The solar radiation that reaches the earth consists of 42–43% of visible light. There have been many efforts done to extend the activity of TiO_2 into visible light region and enhance its photo catalytic efficiency [17]. The literature reports show that the optical absorption and photocatalytic performance of TiO_2 has been improved by doping, mixing with other highly porous and matching band edge semiconductors [18–23]. The coupling of low band gap semiconductor with TiO_2 to form a nanocomposite (NC) also called as heterogenous catalyst, which can absorb both UV and the visible light

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