MINUTES OF DBT-CSB BRAINSTORMING SESSION ON ‘BIOTECHNOLOGICAL APPLICATIONS IN TASAR CULTURE’ HELD ON 8TH JUNE 2016 AT CENTRAL TASAR RESEARCH & TRAINING INSTITUTE, RANCHI

1. A Brainstorming Session was organized jointly by Department of Biotechnology (DBT), New Delhi and Central Silk Board (CSB) on 08.07.2016 at Central Tasar Research & Training Institute (CTR&TI), Ranchi in a view to discuss and identify priority areas of research in applications of biotechnology in Tasar Sericulture and develop some collaborative and network projects. The session was held under the Chairmanship of Prof. L.S. Shashidhara, IISER, Pune (the Chairman of DBT Expert Group on Technology Development in Silk). The list of participants is enclosed at Annexure ‘I’.

2. At the outset, Dr. V.P. Gupta, Scientist D, CTR&TI, Ranchi welcomed the Chairman & Members of DBT Expert Group, invitees, delegates and scientists present in the session. Dr. Mohd. Aslam also welcomed the participants on behalf of DBT and briefed about the objectives of the present brainstorming session.

3. In the inaugural address, Chairman, Prof. L.S. Shashidhara stressed the need to protect the ecosystem while proposing the new projects. He emphasized that there is lot of scope for biotechnological innovations in tasar culture but it can be achieved by implementation of multi-institutional, multidisciplinary collaborative approaches. Prof. C.R. Babu – the Chairman of RAC, CTR&TI, Ranchi has emphasized the need for research on tasar ecoraces conservation, characterization and genome sequencing in form of multi-institutional network project mode.

4. Dr. A.K. Sinha, Director, CTR&TI, Ranchi made the lead presentation giving an overview of tasar culture industry. He explained the priorities and constraints of tasar industry and presented a road map for the Institute by the year 2020 with the biotechnological intervention in various fields of tasar silk industry. The salient features were increasing the fecundity, reducing the gestation period of food plants, management of silkworm virosis, molecular characterization of diverse wild silkworm ecoraces, utilization of vast Sal flora, product diversification, by-product utilization and production of organic silk. He also underlined the need for biotechnological innovations for fabric quality enhancement and by-product utilization.

5. The Scientists of CTR&TI made the presentations on various concepts focussing the areas/constraints and the need of biotechnological interventions to unravel the intricacies of tasar silk industry.

5.1 Dr. G.P. Singh, Scientist-D presented the concept of research proposal on “Development of potent inhibitors using in silico approaches for controlling pebrine in tropical tasar silkworm” under collaboration with BIT, Mesra, Ranchi. Dr. Singh emphasized that there is an urgent need to development the potent inhibitor using in silico approaches to control pebrine disease in tropical tasar silkworm which cause around 20-30% loss to tasar silk industry. The following suggestions were made by the experts:
a) Sequencing of whole genome of Nosema is required to be done for getting the sequence of whole spore wall protein;
b) The protocol of spore wall protein isolation should be modified because SDS lyses the native protein;
c) Selection of ecoraces of A. mylitta for possible resistance against pebrine is to be done;
d) To find out any metabolite(s) providing resistance against pebrine;
e) Broader chemical ecology studies on Nosema and tasar silkworm system will be important.

5.2 Dr. J.P. Pandey, Scientist C presented a research proposal on “Potential utilization of Antheraea mylitta cocoonase /Analogue in silk processing and biomedical fields”. Dr. Pandey also presented the overall progress made in the recently completed DBT funded project along with potential applications of proteolytic enzyme cocoonase in various fields including tasar industry. The Committee suggested the following:

a) The investigators should further characterize the cocoonase of various prominent ecoraces of A. mylitta in order to see the enzyme activity pattern and use the most active cocoonase in future studies.
b) The cocoonase obtained from different sources such as natural and rDNA methods should be properly characterized with reference to its activities.
c) The post-translational modification of recombinant cocoonase should be studied and the activity should be compared with native cocoonase and its analogues.

In the light of above suggestions, it was recommended that the investigators should revise their Phase II proposal (already presented in the last meeting of the DBT Expert Group held on 19.05.2016) and submit the same to DBT for further consideration.

5.3 A project concept on “DNA barcoding and genetic characterization of different ecoraces of tropical tasar silkworm, Antheraea mylitta” was presented by Dr. D.I.G. Prabhu, Scientist-B giving emphasis on the morphological diversity among various ecoraces of A. mylitta and need for the characterization work based on sequence similarities by using the modern molecular biology tools. The following observations and suggestions were made by the Committee:

a) The barcoding may not be required at this stage since mtDNA cannot be useful for intraspecific variation. The utility of barcoding will be limited.
b) SNPs need to be developed from nuclear DNA.
c) A small comprehensive programme on sequencing of whole genome of 2 to 3 ecoraces of A. mylitta is required to be initiated at this stage. The investigators may discuss with Dr. K. P. Arunkumar, CDFD, Hyderabad for more clarity on these issues.

5.4 Dr. M.M. Baig, Scientist B presented a project concept on “Gut-symbiotic associations in Antheraea mylitta feeding on Sal flora and their physiological implications” emphasizing the need to utilize the abundance Sal flora for silkworm rearing by using gut-symbionts. The Committee advised the investigator to generate some basic data on primary and secondary metabolites as well as volatiles in all the three major food plants (Terminalia arjuna, T. tomentosa and Shorea robusta) along with screening the midgut microflora to
tasar silkworm. It was suggested that detailed basic studies are required on metabolomics profiling of tasar silkworm and different host plants (both primary and secondary) so as to develop the strategy and pick up the best combinations towards enhancing silk yield. Broad-based chemical ecology studies on both host plants and insects will be important with multi-components including diversity studies in pebrine, cocoonase etc.

6. The following remarks were also made by the participants after the above presentations:

6.1 Prof. C.R. Babu, the Chairman, RAC-CTR&TI suggested to analyse the genetic basis of variation using whole genome sequence of different ecoraces of tasar silkworm, *Antheraea mylitta* in order to prepare a concrete strategy to conserve endangered ecoraces. He also emphasized the alarming condition of Oak Tasar because of the tiger band disease. He has given emphasis on preparation of mega-project for tasar industry which includes various sub-projects on various aspects, including eco-races conservation and genetic characterization. He also suggested developing high quality root stock and scion for increasing the quality and quantity of tasar food plants.

6.2 Dr. M. Udayakumar, Co-chairman, DBT Expert Group advocated the importance of identification and characterization of root stock and scion interaction in tasar food plants. He emphasized that the primary and secondary metabolites and volatiles have to be analysed and compared with the ecological conditions. Further, he stressed that genomics and transcriptomics studies are important to understand the interaction between tasar silkworm and food plants. As such, high end metabolome profile of the tasar food plants is necessary. He suggested having discussion with Dr. H.V. Thulasiram, NCL, Pune to gain more knowledge on the metabolomics. He also advised the researchers to analyse the pH, organic content of the soil and microclimate of the food plants as these factors play the crucial role in the quality of the foliage.

7. A great deal of discussion was followed after the lead presentation by the Director, CTR&TI, Ranchi and presentation on the concept research ideas by the concerned investigators, the following recommendations were made during the Session:

a) A multi-disciplinary and multi-institutional network project proposal may be developed by CTR&TI, Ranchi in collaboration with other leading institutions in the priority areas suggested / identified during the session. The network programme may include sequencing of whole genome of 2 or 3 ecoraces of tasar silkworm, ecology and genetics of different ecoraces of both tropical and temperate silkworms, chemical ecology studies with reference to disease resistance, cocoonase production along with addressing other aforementioned issues useful to tasar industry.

b) An Expert Committee may be constituted by DBT to guide and develop a programme on chemical ecology of both tasar silkworm and its different food plants addressing various issues including selection of better ecoraces, resistance to pebrine disease, better combinations of tasar silkworm and food plants etc.

The meeting ended with a vote of thanks by Dr. A. K. Sinha, Director, CTR&TI, Ranchi.

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Annexure I

DBT-CSB BRAINSTORMING SESSION ON 'BIOTECHNOLOGICAL APPLICATIONS IN TASAR CULTURE' HELD ON 8TH JUNE 2016 AT CTR&TI, RANCHI

LIST OF PARTICIPANTS

1. Prof. L. S. Shashidhara, IISER, Pune (in Chair)
2. Prof. M. Udayakumar, UAS, Bangalore
3. Prof. C.R. Babu, University of Delhi, Delhi
4. Prof. R.D. Gautum (formerly with IARI, New Delhi)
5. Dr. Mohd Aslam, Advisor, DBT
6. Prof. Saurabh Ghosh, IIT, Delhi
7. Dr. K. P. Arun Kumar, CDFD, Hyderabad
8. Dr. S. Nirmal Kumar, Ex-Director, CSR&TI, Berhampore
9. Dr. A.K. Sinha, Director, CTR&TI, Ranchi
10. Dr. P. K. Mishra, Director (Technical), CSB, Bangalore
11. Dr. Alok Sahay, Director, CSGRC, Hosur
12. Dr. R.K. Mishra, Director, BTSSO, Bilaspur
13. Dr. Umapati Sahay, Retd Prof. & Dean, Ranchi University
14. Dr. D.M. Pandey, Associate Prof, B.I.T., Mesra, Ranchi
15. Dr. R.S. Teotia, Scientist-D, CSB, Bengaluru
16. Dr. N.R. Singhvi, Scientist-D, CSB, Bengaluru
17. Mr. S.K. Sinha, Scientist-D, CTR&TI, Ranchi
18. Gargi, Scientist-D, CTR&TI, Ranchi
19. Suresh Rai, Scientist-D (Stat), CTR&TI, Ranchi
20. Mr. Z.M.S. Khan, Scientist-D, CTR&TI, Ranchi
21. Dr. J. Tirkey, Scientist-D, CTR&TI, Ranchi
22. Mrs. Shova Beck, Scientist-D, CTR&TI, Ranchi
23. Dr. V.P. Gupta, Scientist-D, CTR&TI, Ranchi
24. Dr. G.P. Singh, Scientist-D, CTR&TI, Ranchi
25. A.H. Naqvi, Scientist-D, CTR&TI, Ranchi
26. B. Surendra Nath, Scientist-D, CTR&TI, Ranchi
27. Dr. P.P. Srivastava, Scientist-D, CTR&TI, Ranchi
28. M.D. Tiwari, Scientist-D, CTR&TI, Ranchi
29. Mr. M.C. Joshi, Scientist-D, RTRS, Bhimtal
30. Ms. L. Bidyapati Devi, Scientist-D, RTRS, Imphal
31. Dr. Ram Kumar, Scientist-C, CTR&TI, Ranchi
32. Ms. Mukherjee, Scientist-C, CTR&TI, Ranchi
33. Ms. S. Nagendra, Scientist-C, CTR&TI, Ranchi
34. Ms. Susmita Das, Scientist-C, CTR&TI, Ranchi
35. J. P. Pandey, Scientist-C, CTR&TI, Ranchi
36. K.P. Kiran Kumar, Scientist-C, CTR&TI, Ranchi
37. K.N. Madhusudan, Scientist-C, CTR&TI, Ranchi
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