

PROFORMA – 1 (To be filled by applicant)

PART 1: GENERAL INFORMATION:

1	Name of the Institute / University / Organization submitting the project proposal	:	Central Sericultural Germplasm Resources Centre, Central Silk Board, Hosur-635 109, Tamil Nadu.
2	Status of the Institute(s)	:	[Only for non-CSB institutions]
3	Name(s) and designation(s) of the Executive Authority of the Institute/ University forwarding the application	:	The Director, Central Sericultural Germplasm Resources Centre, Central Silk Board, Hosur-635 109.
4	Project Title	:	“Evaluation of exotic bivoltine silkworm breeds to identify promising parental genetic resources”.
5	Category of the project	:	New project
6	Specific Area	:	Short listing of exotic bivoltine silkworm genetic resources, identification of promising breeds based on important economic traits (fecundity no.), pupation (%), ERR by weight (Kg), Single cocoon weight(g), Single shell weight(g), Total larval duration, Filament length(m), Reelability(%), Raw silk (%), Boil-of-loss and Neatness (%) grouping of breeds under oval and dumb-bell shape, line x tester analysis for identification of exotic bivoltine silkworm genetic resources, hybridization of exotic collection and evaluation by utilizing the selected parental oval and dumb-bell breeds.
7	Duration	:	03 years (June 2016 –September 2019)

8	Total cost	:	10.25 lakhs.
9	Is the project single institutional or multi-institutional (S/M)	:	Multi- institutional,
10	If the project multi-institutional, please furnish the following Name, Designation and Address of the Project Co-ordinators	:	Director, CSGRC, Hosur Director, CSRTI, Mysore, Director, CSRTI, Berhampore. Director, CSRTI, Pampore
11	Project summary	:	<p>The Central Sericultural Germplasm Resources Centre (CSGRC) is the national nodal centre for conservation of sericultural germplasm in the country for collection, characterization, evaluation, conservation and supply of mulberry and silkworm genetic resources.</p> <p>The silkworm gene bank of CSGRC maintains and conserves 470 silkworm accessions. The conservation rearing of 470 silkworm genetic resources are under taken with 81 multivoltine (5 crops / year), 369 bivoltine (single crop in three batches and 20 mutants (2 crops / year).</p> <p>Confirmatory morphological characterizations with 26 descriptors are carried out during all stages of growth and reproduction. All these accessions are maintained true to type. The morphological and reproductive parameters of all accessions are well documented through publication of catalogue(s). Some of elite accessions were evaluated at different agro-climatic conditions of different zones. Though silkworm germplasm constitute the potential raw material and having wide variation in their genotypic expressions, there is always under utilization of silkworm germplasm resources for</p>

		<p>breeding programs. As narrated by different breeders, varied silkworm germplasm stocks contribute immensely to the development of viable and hardy silkworm breeds for commercial exploitation. (Nirmal Kumar and Sreeramareddy, 1994). Breeders involved in silk crop improvement programme can utilize these identified breeds as parent material for heterosis breeding. Heterosis breeding in silkworm has contributed in increasing cocoon production improving the quality of raw silk (Govindan <i>et al.</i>, 1996). Genetic difference between parents should be wide to get heterosis as either positive or negative heterosis is expressed in the cross (Dalton, 1987). Un adapted exotic collection can be pre-bred with indigenous well adapted low productive breeds to make genetic complexes for extraction of valuable genes through hybridization (Kumaresan <i>et al</i>, 2004).</p> <p>In this context, this project is proposed to evaluate the performance of promising exotic bivoltine breeds for important economic parameters such as, fecundity (no.), pupation (%), ERR by Wt. (Kg.), Single cocoon weight (g), Single shell weight (g), Larval duration (hrs.), Filament length (m), Reelability (%), Raw silk (%), Boil-off loss and Neatness (%) and combining ability as parental breeds and also heterosis effect of selected breeds among the different exotic bivoltine silkworm genetic resources.</p>
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PART II: PARTICULARS OF INVESTIGATORS(CSGRC,HOSUR)		
12.1	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	: Ms. M. MUTHULAKSHMI : 01.06.1967 : Female : PI : Scientist-D : Silkworm Division, : CSGRC, Hosur. 2 + 3 (PI + CI)
12.2	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present	: Dr. Veeranna Gowda 05.05.1962 Male CI Scientist-D Silkworm Division, CSGRC, Hosur 2 + 2 (PI + CI)
12.3	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Ms. Anuradha H. Jingade 18.01.1963 Female CI Scientist-D Silkworm Division, CSGRC, Hosur. 1 +1 (PI +CI)

12.4	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Dr. S. Nivedita 26.06.1966 Female CI Scientist-D Silkworm Division, CSGRC, Hosur. 1 + 1 (PI + CI)
PARTICULARS OF INVESTIGATORS(CSRTI,MYSORE)		
	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Dr. C. M. Kishor Kumar 20.07.1963 Male PI Scientist-D Bivoltine Silkworm Breeding Laboratory, CSRTI, Mysore 1 + 2 (PI + CI)
	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Smt. P. V. Soudaminy 05.05.1967 Female CI Scientist-C Bivoltine Silkworm Breeding Laboratory, CSRTI, Mysore

PARTICULARS OF INVESTIGATORS(CSRTI,BERHAMPORE)		
	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Dr. A. K. Verma 28.12.1960 Male CI Scientist-D Silkworm Breeding & Genetics SEction, CSRTI, Berhampore, West Bengal. 4 + 1 (PI + CI)
	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Mr. Zakir Hossain 22.12.1962 Male CI Scientist-C Training Division, CSRTI, Berhampore, West Bengal. 1 (CI)
PARTICULARS OF INVESTIGATORS(CSRTI,PAMPORE)		
	Name Date of birth Sex Indicate whether PI/CI Designation Department Institute/University: Address Number of projects being handled by investigator at present.	Dr. Babulal 10.10.1962 Male PI Scientist-D Silkworm Breeding and genetics, CSRTI, CSB,Pampore-192121, J&K 2 + 2 (PI + CI)

	Name	Dr. D. Guruswamy
	Date of birth	01.06.1962
	Sex	Male
	Indicate whether PI/CI	CI
	Designation	Scientist-C
	Department	Silkworm Breeding and genetics,
	Institute/University: Address	CSRTI, CSB, Pampore-192121, J&K
	Number of projects being handled by investigator at present.	1+3 (PI + CI)

13	Introduction	<p>Selection of parents as resource material is a prerequisite contributing to the success of breeding potential breeds / hybrids. Thorough and proper evaluation of the genetic resources and utilization of the native breeds of potential nature will help the breeder to select most effective genotypes before choosing the materials for breeding. Balancing and fixing the desirable traits for local environments being the challenge for the breeder, proper understanding on the range of reaction of the selected genotypes under variable environmental conditions for appropriate use in breeding programme is very essential.</p> <p>In India most of the Sericultural areas are under tropical regions and 90% of the raw silk production comes from crossbreeds (Multi. x biv.). Since bivoltine races were also one of the counterparts to produce crossbreed, emphasis was given towards development of high yielding bivoltine breeds.</p> <p>It is evidenced from various reports that, for evolving new breeds from the indigenous bivoltine parents, NB4D2 was utilized 33 times, followed by Kalimpong-A 19 times and other bivoltines 21 times. The above facts clearly indicate excessive use of few silkworm races as parent material and under utilization of the existing silkworm germplasm resources. As an example, bivoltine races like, Boropolu and Borapat which are very much adapted to Indian conditions were not utilized in</p>
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	<p>any breeding programme.</p> <p>In India most of the Sericultural areas are under tropical regions and 90% of the raw silk production comes from crossbreeds (Multi x biv). Since bivoltine races were also one of the counterparts to produce crossbreed, emphasis was given towards development of high yielding bivoltine breeds</p> <p>Ghosh (1949) by reviewing the earlier silkworm breeding work done in India and reported that, Nistari and Chotopolu were utilized to cross with Italian race. Among the Research Institutes, Cenral Sericultural Research and Training Institute, Berhampore, Mysore and Pampore and Regional stations working under those institutes were the pioneers in silkworm breeding. CSRTI, Berhampore initiated silkworm breeding by working an elaborate way between 1960s to 1980s and came out with many new high yielding bivoltine breeds like SK3, SK4, SK5, SK6, SK7, YB and BHR series.</p> <p>Recently, many high yielding CSR series evolved by CSRTI, Mysore are in the field for temperate conditions. (Datta <i>et al</i> 2000) CSRTI, Pampore evolved many races like PAM series, which are very popular in Kashmir. The Regional Sericultural Research stations (RSRSs) under CSRTI, Jammu, Dehradun and Kalimpong evolved JAM series; SH 6, YS3, SF19 and KPG-A, KPG-B respectively. One of the aims of silkworm breeders is to develop promising bivoltine breeds to suit to the tropical climatic condition of India. The success of silkworm breeds developed with great caution by the silkworm breeders mainly depends o its combining ability quite a good number of bivoltine breeds with high silk content and raw silk recovery developed at CSRTI, Mysore are being maintained systematically and presently the single hybrid CSR2xCSR4 and the double hybrid (CSR2xCSR27) x (CSR6xCSR26) are being extensively reared in India (Basavaraja <i>et al.</i>, 2002) which have played a key role in boosting bivoltine silk production in India.</p> <p>CSGRC, Hosur is mandated to collect, characterize, evaluate,</p>
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		<p>conserve and promote utilization of silkworm genetic resources. The data recorded were consolidated and published in the form of three catalogues, which were also reached to all the institutes and universities involved in silkworm crop improvement program and other related research studies and it is observed that scientists have indented mostly for popular races. Hence, it is obvious that, most of the potential genetic resources remained unutilized by the silkworm breeders. India is now on the threshold of utilizing the silk industry in development of silkworm breeds for high silk productivity. Presently, India is producing mainly upgradeable silk from multi x biv cross breeds, which is mostly suitable for handlooms. In the recent years, powerlooms are emerging as major consumers of raw silk to produce fine silk fabrics of high quality, for which international grade silk is essential. Therefore, the silkworm breeding strategy will be oriented towards preparation of bivoltine hybrids involving exotic bivoltine breeds with high silk productivity.</p>
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PART – III: TECHNICAL DETAILS OF PROJECT:

13.1	Definition of the problem	<p>This project aims at evaluating exotic bivoltine silkworm genotypes conserved at CSGRC, Hosur through pre-breeding and to study,</p> <ol style="list-style-type: none"> 1. Evaluation and short listing of exotic bivoltine silkworm genetic resources based on important quantitative and qualitative traits, 2. Grouping of short listed exotic bivoltine breeds under oval and dumbbell shape, 3. Line x Tester analysis for identification of promising exotic parental (Both oval and dumb-bell) breeds, 4. Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds. 5. Region-wise evaluation of promising exotic bivoltine hybrids.
13.2	Origin of the proposal / Rationale of	<p>Exotic bivoltine silkworm genetic resources available at CSGRC, Hosur was not explored by the breeders so far and also Studies related to evaluation of exotic bivoltine silkworm genetic resources from csgrc gene</p>

	the study	bank is not yet attempted. Therefore, it is proposed to conduct evaluation involving promising exotic bivoltine silkworm genotypes from silkworm gene bank of CSGRC, Hosur.
13.3	Relevance to the Current Issues and Expected outcome	<p>India is now on the threshold of utilizing the silk industry in development of silkworm breeds for high silk productivity. Presently, India is producing mainly non-gradable silk from multi x biv. cross breeds, which is mostly suitable for handlooms. In the recent years, power looms are emerging as major consumers of raw silk to produce fine silk fabrics of high quality, for which international grade silk is essential. Therefore, our silkworm breeding strategy should be oriented towards preparation of bivoltine hybrids with high silk productivity.</p> <p>The study will focus on identification of potential exotic bivoltine parental breeds for utilizing in bivoltine breeding and hybrid seed production for commercial exploitation.</p>
13.4	Objective	To identify bivoltine silkworm germplasm for specific qualitative and quantitative traits.
14	Review of status of research and development on the subject:	
14.1	International status	<p>Sericulture requires a continuous flow of productive silkworm breeds and host plant varieties to meet the ever-changing demand of people involved in the industry besides the consumer sector. The breeding of silkworm since long has been aimed towards evolving superior and hardy breeds either by means of selection alone or by combining out crossing or backcrossing with selection in the subsequent generations. The final aim of the breeder is primarily to evolve a breed which can give stabilized crops and secondly to improve both quantity and quality of silk (Tazima, 1984). A large number of silkworm breeds capable of well defined qualitative and quantitative traits. But identification of suitable F1 hybrid combination</p>

	<p>of evolved breeds reflecting the desirable characters of parents and heterotic expression of parental combinations need investigation (Harada,1961,Gamo,1976,Gamo and Hirabayashi,1983). Exploitation of heterosis in silkworm has been known for more than half century and has been extensively carried out by many workers (Yokoyama,1957., Harada,1961, Hiobe,1969) to select suitable hybrids for assessing the nature and magnitude of gene action involved for the expression of various quantitative characters, as it plays a crucial role in phenomenal increase in global silk production.</p> <p>To meet all these requirements, the breeder needs very wide and inexhaustible genetic resources to meet the ever-changing demands from various sectors. Considering the great economic importance of <i>Bombyx mori</i>, silk producing countries such as China, Japan, India, Russia, Korea, Bulgaria and Iran have collected number of silkworm breeds suitable for a wide range of agro-climatic conditions. More than 4000 strains are maintained in the germplasm of <i>Bombyx mori</i> and 46 institutes are involving in silkworm genetic resources maintenance, which includes univoltine, bivoltine and polyvoltine strains. These different genotypes display large differences in their qualitative and quantitative traits that ultimately control silk yield. To help the breeders in the process to identify the parents that nick better, several methods of divergence analysis based on quantitative traits have been proposed to suit various objectives. As most of the desirable characters in silkworm are of quantitative nature, multivariate statistical methods have been employed to measure the genetic diversity among</p>
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		<p>the stocks (Goldsmith, 2009). Genetic diversity can be assessed among different accessions/individuals within the same species (intraspecific), among species (interspecific) and between genus and families. It plays an important role in any breeding either to exploit heterosis or to generate productive recombinants. The choice of parents is of paramount importance in breeding program. Hence, the knowledge of genetic diversity and relatedness in the germplasm is a prerequisite for crop improvement programs (Bindroo and Manthiramoorthy, 2014).</p>
14.2	National status	<p>Indian sericulture industry dominated by multi x biv. silk on the threshold of vitalizing the industry with greater emphasis on improvement of quality through adoption of bivoltine sericulture suitable to tropical condition. The methods applied for evaluation and identification of potential breeds are of vital importance in achieving the objective of developing parental strains. Therefore, progress in breeding, regardless of seasons or environment, revolves around the efficiency of selectiong the promising parental breeds. (Basavaraja <i>et al.</i>, 1995, Data <i>et al.</i>, 2001).</p> <p>CSGRC, Hosur is conserving 470 silkworm germplasm accessions comprising of 81 multivoltine 369 bivoltine accessions and 20 mutant genetic stocks. Database is generated from preliminary evaluation for growth, reproductive and post cocoon parameters. Conservation must be accompanied by effective utilization of germplasm on sustainable basis so as to enhance the usefulness of large collection, which will justify long term investments on conservation of gene pool (Thangavelu and Sinha, 2002).</p>

		<p>The genetic resources contain functional units of heredity and are having actual or potential value. The variation exhibited in these genetic resources of <i>Bombyx mori</i> provides lot of scope for utilization in the silkworm breeding program. The exotic genetic resources collected and introduced in the silkworm gene bank exhibits sufficient variation to contribute positively to silk productivity. Varied silkworm germplasm stocks contribute immensely to the development of viable and hardy silkworm breeds for commercial exploitation (Nirmal Kumar and Sreerama Reddy, 1994). Breeders involved in silk crop improvement programme can utilize these identified breeds as parent material for heterosis evaluation breeding. Heterosis breeding in silkworm has contributed in increasing cocoon production and improving the quality of raw silk (Govindan <i>et al.</i>, 1996). Genetic difference between parents should be wide to get heterosis and to know either positive or negative heterosis is expressed in the cross (Dalton, 1987). The manifestation of heterosis in silkworm <i>Bombyx mori</i> L. has been demonstrated by many researchers (Datta <i>et al.</i>, 2001, Talebi and Subramaniya, 2009, Nirmal Kumar <i>et al.</i>, 2010). Heterosis expressed as the involvement in a character shown by the hybrid over their parental values is a vital measure of the genetic progress made in plants, animals and silkworm breed selection. Exploitation of heterosis through hybrids in silkworm for economic traits triggered a revolutionary change in overall qualitative and quantitative silk output (Harada, 1961, Gamo, 1976, Subbarao and Sahai, 1989, Nagaraju <i>et al.</i>, 1996) Muthulakshmi <i>et al.</i>, (2011) reported that the bivoltine</p>
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		<p>germplasm accessions BBE-0266, BBE-0178 and BBE-0198 performed better than local ruling breed (Jam-25) and national control (CSR-2) for rearing and reeling parameters at high temperature and high humidity which prevails during the autumn season in Jammu region, and BBE-0266 and BBE-0178 have performed better than both the respective local ruling breeds and CSR-2 during the autumn season of Sahaspur (Muthulakshmi <i>et al.</i>, 2014) So, There is an urgent need for increased utilization of silkworm genetic resources both for direct commercial exploitation and indirectly for evolution of high yielding breeds with improved quality. A correct selection of donor parent shall depend on a correct understanding of germplasm material as well as gene pool from which the suitable donors to be selected.</p> <p>Effective utilization of genetic resources depends on development and use of efficient screening technique. Prebreeding activities with stress on base broadening linked with main silkworm breeding programme of the Institute. Un adapted exotic collection can be prebred with indigenous well adapted low productive breeds to make genetic complexes for extraction of valuable genes through hybridization (Kumaresan, 2004)</p> <p>Hence, it is planned to conduct evaluation involving promising exotic bivoltine silkworm genotypes from silkworm gene bank of CSGRC, Hosur.</p>
14.3	Importance of proposed project in the context of current status	<p>India being a tropical country with fluctuating temperature and humidity condition is placed next to China in the global ilk scenario in spite of the raw silk quality yet to match the international standards. To achieve a quantum jump in production of quality silk,</p>

		<p>evolution of better bivoltine breeds/hybrids is very much necessary. Presently, India is producing mainly non-gradable silk from multi x biv. cross breeds, which is mostly suitable for handlooms. In the recent years, power looms are emerging as major consumers of raw silk to produce fine silk fabrics of high quality, for which international grade silk is essential. Though silkworm germplasm constitute the potential raw material and having wide variation in their genotypic expressions, there is always under utilization of silkworm germplasm resources especially exotic bivoltine breeds for breeding programs. Therefore, the silkworm breeding strategy will be oriented towards involving exotic bivoltine silkworm genetic resources at CSGRC, Hosur in preparation of bivoltine hybrids with specific qualitative and quantitative traits.</p>
14.4	Anticipated products, processes/ Technology packages, information or other outcome from the project and their expected utility	<p>➤ Identified exotic parents will be utilized in bivoltine breeding program and hybrid seed production at commercial level,</p> <p>➤ Best combination of promising exotic bivoltine breeds will be selected for making double hybrids through line x tester analysis.</p>
14.5	Expertise available with proposed investigation group/ Institution on the subject of the project	<p>PI and CI are having sufficient experience in the field of bivoltine silkworm germplasm rearing, maintenance, grainage works, F1 seed production, pre-breeding as well as conservation and characterization of bivoltine silkworm germplasm.</p>
17. WORK PLAN:		
15.1	Methodology	<p>Evaluation, Characterisation and conservation rearing of 369 accessions of bivoltine silkworm germplasm resources are divided into three batches for rearing convenience and</p>

		<p>being reared and evaluated in three different seasons (BV - I batch with 115 accessions during June-Sept., BV - II batch with 137 accessions during Sept.-Dec. and BV - III batch with 113 accessions during Dec. - March of every year).</p> <p>Exotic bivoltine silkworm germplasm accessions at CSGRC, Hosur are taken up for rearing under regular maintenance / conservation program in three batches spread across whole year. So, there is a need to sort out all the exotic accessions based on their rearing performance and evaluate their commercial characteristics based on available database. Once best performers are sorted their hybrids can be exploited for taking up rearing during favourable seasons of the three different geographical regions of the country. This will pave the way for utilization of exotic silkworm resources available at CSGRC for exploitation of their hybrid vigor. CSGRC can recommend further to exploit these exotic genetic bivoltine resources.</p> <p>First year: Evaluation and short listing of exotic bivoltine silkworm accessions available at CSGRC, Hosur based on available Silkworm Germplasm Information system (SGIS) database.</p> <p>Evaluation will be done based on important economic parameters such as fecundity (no.), pupation (%), ERR by wt. (Kg), single cocoon weight (g), single shell weight (g), filament length (m), reelability (%), raw silk (%), boil-off loss and neatness (%). Evaluation index / Multiple Trait Evaluation Index method will be utilized for ranking and further short listing of bivoltine exotic breeds (Mano <i>et al.</i>, 1993). Rearing and evaluation of short-listed breeds will also be completed.</p>
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		<p>Second year:</p> <p>Evaluation rearing of twenty short listed top ranking exotic bivoltine breeds (both oval-10) and dumb-bell-10) will be conducted at CSGRC, Hosur. These promising top ten, each of oval and dumb-bell breeds, will be used for conducting line x tester analysis for identification of promising exotic bivoltine breeds as parents. Line x tester analysis with popular breed as tester will be done and hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will also be carried out. Dfls of hybrid combinations will be prepared for supply to the collaborating institutes viz; CSRTI, Mysore, Berhampore and Pampore for conducting two trials (first and second crop) during favorable seasons specified by them.</p> <p>Third Year:</p> <p>Third and fourth crop evaluation of promising exotic bivoltine hybrids at CSGRC, Hosur, CSRTI, Mysore, CSRTI, Berhampore (North east centres) and CSRTI, Pampore</p> <p>Experiment-I :</p> <p>Screening and evaluation of top ten exotic bivoltine breeds for assessing important economic parameters and Rearing and evaluation of 50short-listed breeds.</p> <p>Experiment-II:</p> <p>Line x Tester analysis with popular breed as tester, with both oval and dumbbell breeds for identification of promising exotic bivoltine breeds.</p> <p>Experiment-III:</p> <p>Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds in different regions.</p>
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15.2	Organization of work elements at collaborative Institutes	<p><u>For CSGRC, Hosur</u></p> <p>June 2016-September 2016:</p> <p>Screening and evaluation of all exotic bivoltine breeds for important economic parameters and short listing exotic breeds (oval and Dumb-bell) based on available database, Grouping of exotic bivoltine silkworm germplasm based on cocoon shape oval/dumbbell(oval-10 and dumb-bell-10), and conducting evaluation rearing and production of dfls of selected accessions for supply to the collaborative centres</p> <p>October 2016-June 2017</p> <p>Line x tester analysis of top ten exotic BV accessions with popular breed as tester for both oval and dumbbell breeds and hybrid evaluation by utilizing the selected oval and dumb-bell parental breeds at CSGRC, Hosur and preparation of dfls for supply to the Collaborating Institutes.</p> <p>July 2017-September 2019</p> <p>Supply of dfls of hybrid combinations for evaluation of promising exotic bivoltine hybrids (4 trials) at CSGRC, Hosur, CSRTI, Mysore, CSRTI, Berhampore (trials at North east centres) and CSRTI, Pampore. Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will also be carried out at CSGRC, Hosur in 4 crops during September-17, December-17 and September-18 and December-18. Data will be recorded on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits. Supply of stifled cocoons from 3rd and 4th crop rearing from collaborative Institutes to CSGRC, Hosur for reeling analysis, Compilation of</p>
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		<p>data and statistical analysis and preparation of final report.</p> <p><u>For CSR&TI, Mysore</u></p> <p>Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will also be carried out at CSRTI, Mysore during September-17, December-17, September-18 and December-18. Recording of the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for post cocoon evaluation will also be attended.</p> <p><u>For CSR&TI, Berhampore</u></p> <p>Evaluation of hybrids by utilizing the selected parental oval and dumb-bell breeds as parents will also be carried out in at CSRTI Berhampore (North east centres) during November-17, February-18, November-18 and February-19. Data will be recorded on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits.</p> <p><u>For CSR&TI, Pampore</u></p> <p>Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will also be carried out at CSRTI, Pampore during first week of September,17, first week of May,18, first week of September,18 and first week of May,19 and recording the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits.</p>
15.3	Proprietary/patented items, if any, expected to be used for this project	Resulted new hybrid combination will be patented.

15.4	Suggested plan of action for utilization of the expected outcome from the project	Identified exotic bivoltine parents will be utilized in bivoltine breeding program and hybrid seed production at commercial level.
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Quarter-wise milestones for work component under the newly proposed collaborative research project on “**Evaluation of exotic bivoltine silkworm breeds to identify promising parental genetic resources**”.

2016-17	Quarter-I April -June 2016	Quarter-II July- September 2016	Quarter-III October- December 2016	Quarter-IV Jan -March 2017
Work component	Shortlisting of Exotic bivoltine accessions	Conducting first evaluation rearing of shortlisted accessions, Grainage operations and preparation of dfls	Conducting second evaluation rearing of shortlisted accessions, Grainage operations and preparation of dfls and identification of top ten each of oval and dumb-bell breeds	Conducting evaluation rearing of promising top ten, each of oval and dumb-bell breeds along with tester and conducting line x tester analysis for identification of promising hybrid combination using promising exotic bivoltine breeds as parents and popular breed as tester.
Milestones to be achieved	Top ranking accessions will be shortlisted from available database and earlier studies like AIMSSEP	First evaluation trial with shortlisted accessions will be Completed	Completion of Second evaluation trial and Dfls of shortlisted exotic BV accessions (Oval and dumbbell) will be prepared	Evaluation rearing of promising top ten hybrid combinations will be completed with oval and dumbbell exotic breeds
2017-18	Quarter-I April -June 2017	Quarter-II July- September 2017	Quarter-III October- December 2017	Quarter-IV Jan -March 2018
Work component	Line x tester analysis with popular breed as tester will be done Preparation of dfls of hybrid combinations for supply to the	Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will also be carried out at CSRTI, Mysore (I	Supply of dfls of hybrid combinations and conducting the evaluation at CSRTI, Berhampore (I crop) and CSRTI, Mysore (II crop) along with	Grainage operations and preparation of dfls for supply to the collaborative centres. Conducting trial at CSRTI, Berhampore (

	collaborative centres.	crop), Pampore (I crop) along with CSGRC, Hosur(I crop) recording the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits	CSGRC, Hosur(II crop) ,recording the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits	II crop) recording the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits
Milestones to be achieved	Preparation of dfls of hybrid combinations will be done for supply to the collaborative centres to conduct evaluation rearing	Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will be completed at CSRTI, Mysore, Pampore (I crop) along with CSGRC, Hosur Will be completed	Hybrid evaluation by utilizing the selected parental oval and dumb-bell breeds will be completed at CSRTI, Berhampore(I trial) and CSRTI, Mysore (II crop)along with CSGRC, Hosur(II trial) Will be completed	Dfls preparation for supply to the collaborative centres and rearing trial of CSRTI, Berhampore(IIcrop) will be completed
2018-19	Quarter-I April -June 2018	Quarter-II July- September 2018	Quarter-III October- December 2018	Quarter-IV Jan -March 2019
Work component	Supply of dfls of hybrid combination by utilizing the selected parental oval and dumb-bell breeds and rearing trial will be carried out at CSRTI, , Pampore (II crop)	Supply of dfls of hybrid combination by utilizing the selected parental oval and dumb-bell breeds and rearing trial will be carried out at CSGRC, Hosur (III crop) CSRTI, Mysore (III crop)and Pampore(III crop) recording the data on the important economic parameters of	Supply of dfls of hybrid combination by utilizing the selected parental oval and dumb-bell breeds and rearing trial will be carried out at CSGRC, Hosur (IV crop)CSRTI, Mysore(IV crop) , CSRTI,Berhampore(3 rd crop) recording the data on the important economic parameters of rearing and grainage, disease	Supply of dfls of hybrid combination by utilizing the selected parental oval and dumb-bell breeds and rearing trial will be carried out at CSRTI, Berhampore (4 th crop) recording the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of

		rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits	incidence and supply of cocoons for evaluation of post cocoon traits	post cocoon traits
Milestones to be achieved	Completion of 3 rd Crop) at CSRTI, , Pampore	Completion of III crop at CSRTI,Mysore ,Pampore and CSGRC,Hosur	Completion of rearing at CSGRC, Hosur (IV crop)CSRTI, Mysore(IV crop) , CSRTI, Berhampore(3 rd trial	Completion of 4 th crop at CSRTI, Berhampore
2019-2020	Quarter-I April -June 2019	Quarter-II July- September 2019		
Work component	Supply of dfls of hybrid combination by utilizing the selected parental oval and dumb-bell breeds and rearing trial will be carried out at CSRTI, , Pampore(4th Crop) recording the data on the important economic parameters of rearing and grainage, disease incidence and supply of cocoons for evaluation of post cocoon traits	Supply of stiffler cocoons from 3 rd and 4 th crop rearing from collaborative Institutes to CSGRC,Hosur for reeling analysis,statistical analysis of data and compilation of report.		
Milestones to be achieved	Completion of 4th Crop) at CSRTI, , Pampore	Reeling analysis, data compilation and statistical analysis and submission of report.		

Short listed exotic bivoltine accessions based on earlier characterization and evaluation studies including AIMS GEP

Sl. No.	Acc. No.	Name	cocoon shape	Performance
1	BBE-0005	MEIGITSU	oval	Top ranking
2	BBE-0163	THAICHOAN	oval	Top ranking
3	BBE-0232	NB1	oval	Top ranking
4	BBE-0329	MIR-4	oval	AIMS GEP
5	BBE-0013	CHAUNG NAUNG	oval	Top ranking
6	BBE-0154	J-MARKED	oval	Top ranking
7	BBE-0201	C124	oval	Top ranking
8	BBE-0225	JZH (PO)	oval	Top ranking
9	BBE-0043	BELKOKONA-II	oval	Top ranking
10	BBE-0266	J2P	oval	AIMS GEP/Hot spot
11	BBE-0143	KY-1	Dumb-bell	Top ranking
12	BBE-0155	J-DEEP MARKED	Dumb-bell	Top ranking
13	BBE-0164	SHOGETSU HOSHO	Dumb-bell	Top ranking
14	BBE-0268	J1M	Dumb-bell	AIMS GEP
15	BBE-0169	SHINKI RAYAKU (M)	Dumb-bell	Top ranking
16	BBE-0267	14M	Dumb-bell	Top ranking
17	BBE-0177	JPN5 x B25	Dumb-bell	Top ranking
18	BBE-0197	A	Dumb-bell	AIMS GEP
19	BBE-0050	UKR-2	Dumb-bell	Top ranking
20	BBE-0035	SANISH-18(M)	Dumb-bell	Top ranking

TIME SCHEDULE OF ACTIVITIES GIVING MILESTONES				
Sl. No.	Expected Date of		Outcome measurable	
	Starting	Completion		
1	June 2016		1. Evaluation and short listing of exotic bivoltine silkworm genetic resources based on important quantitative and qualitative traits, 2. Grouping of short listed exotic bivoltine breeds under oval and dumb-bell shape, 3. Line x tester analysis for identification of promising exotic parental (both oval and dumb-bell) breeds, 4. Hybrid evaluation by utilizing the selected oval and dumbbell parental breeds. 5. Region-wise evaluation of promising exotic bivoltine hybrids.	
		June 2019		
Name of the agency		Proposed Research aspects	Proposed Amount (Rs. in lakhs)	Cost sharing (%)
Central Silk Board		New project / studies	7.15 (For CSGRC,Hosur)	--
			2.50 (For CSRTI, Mysore)	
			0.30 (For CSRTI, Berhampore)	
			0.30 (For CSRTI, Pampore)	

PART IV: BUDGET PARTICULARS

16. BUDGET: [In case of multi-institutional projects, the budget details should be provided separately for each of the Institute]

Regular Budget of the Institute / CSB will be utilized.

1. CSGRC, Hosur

A. Non-Recurring (e.g. equipments, accessories, etc.)

Sl. No.	Item	1 st Year	2 nd Year	3 rd Year	Total(Rs.)
1.	Room Heaters (2 Nos.)	20,000	-	-	20,000
	Total	20,000	0	0	20,000

B. Recurring

Man power: Project Assistant (in lakhs)

Designation	2016-2017	2017-2018	2018-19	Total
Project Assistant	1.2	1.2	1.2	3.60

2. Consumables:

(in lakhs)

Name of the Equipment	No. required	I year	II year	III year	Total
Plastic Rearing trays	150	1.30	-	-	1.30
Composite cellules	100	0.15	-	-	0.15
Flame burner	01	0.10	-	-	0.10
Plastic collapsible mountages	100	0.30	-	-	0.30
Bed cleaning nets (HDPE)	100	0.20	-	-	0.20
Mounting nets	100	0.05	-	-	0.05
Litter bin	4	0.10	-	-	0.10
Stationaries	-	0.05	0.05	0.05	0.15
Others					
Travel		0.25	0.25	0.50	1.00
Total		2.50	0.30-	0.55-	3.35

ABSTRACT OF BUDGET**(in lakhs)**

Sl. No.	Item	1 st Year	2 nd Year	3 rd Year	Total
1	Recurring	1.2	1.2	1.2	3.60
2	Non-Recurring	0.2	--	--	0.20
3	Consumables	2.50	0.30	0.55	3.35
Total (Rs.)		2.70	0.30	0.55	7.15

2. At CSRTI, Mysore**Consumables: (in lakhs)**

Name of the Equipment	No. required	I year	II year	III year	Total
Disinfectants		0.20	0.20	0.20	0.60
Stationeries		0.05	0.05	0.05	0.15
Total		0.25	0.25	0.25	0.75
Others					
travel		0.25	0.25	0.50	1.00
Contingency		0.25	0.25	0.25	0.75
Total		0.75	0.75	1.0	2.50

ABSTRACT OF BUDGET: (in lakhs)

Sl. No.	Item	1 st Year	2 nd Year	3 rd Year	Total
1	Recurring	--	--	--	--
2	Non-Recurring		--	--	
3	Consumables +others	0.75	0.75	1.0	2.50
Total (Rs.)		0.75	0.75	1.0	2.50

CSRTI, Berhampore:

Sl. No.	Item	Budget (Rs. lakh)		
		2017-18	2018-19	Total (Rs.)
1.	Room Heaters (2 Nos.)	0.10	-	0.10
2.	Consumable	0.10	0.10	0.20
	Total	0.20	0.10	0.30

CSRTI, Pampore

Sl. No.	Item	Budget (Rs. lakh)		
		2017-18	2018-19	Total (Rs.)
1.	Room Heaters (2 Nos.)	0.10	-	0.10
2.	Consumable	0.10	0.10	0.20
	Total	0.20	0.10	0.30

PART V: FACILITIES AVAILABLE AT CSGRC, HOSUR

Sl No.	Particulars	Existing Number	Present Status
Infra Structure:			
1	Silkworm Rearing House	01	Used for conservation of silkworm genetic resources.
2	Grainage	01	Under establishment / conversion of rearing building into grainage.
3	Reeling section	01	Reeling section has facilities for post cocoon quantitative characterization and qualitative characterization at CSTRI, Bangalore.
4	Cold Storage Plant	01	Situated in CSGRC Campus under NSSO, Bangalore.
Equipment/Rearing facilities:			
1	Rearing stands	10	Being Used during conservation rearing
2	Plastic Rearing trays	100	-do-
3	Leaf chopping machine	01	-do-
4	Micro centrifuge	01	-do-
5	Power Sprayers	01	-do-
6	Circumferential Room heaters	02	-do-
7	Flame burner	01	-do-
8	Single cocoon assessment balance	01	-do-
9	Deflossing machine	01	-do-
10	Platform balance	01	-do-

11	Digital cocoon weighing balance (10 kg)	01	-do-
12	Plastic collapsible mountages	100	-do-
13	Bed cleaning nets(HDPE)	100	-do-
14	Mounting nets	100	-do-
15	Litter bin	04	-do-
16	Feeding stands	04	-do-
17	Microscope	02	-do-
18	Student microscope	02	-do-

PART VI:

REFERENCES:

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- 2) Bharat Bhusan Bindroo and Shunmugam Manthira Moorthy, 2014 . Genetic Divergence, Implication of Diversity, and Conservation of Silkworm, *Bombyx mori* International Journal of Biodiversity, 564850, 15 pages.
- 3) Dalton, D.C. (1987) An introduction to practical animal breeding. Second edition, English Language Book Society/Collins
- 4) Datta, R. K., Suresh Kumar, N., Basavaraja, H. K., Kishore Kumar, C.M. and Mal Reddy, N. (2001). “CSR18 x CSR19”-A Robust bivoltine hybrid for all season rearing. *Indian silk* April, 5-7.
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- 15) M. Muthulakshmi, N. Balachandran, A.A. Siddiqui, T.P.S. Chauhan, S.A. Hiremath and V. Sivaprasad 2014. Evaluation of selected bivoltine silkworm germplasm under abiotic stress conditions of northern India. *Sericologia* 54 (2): 113-121
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PART VII: BIO-DATA OF PRINCIPAL INVESTIGATOR

Name : M.Muthulakshmi

Designation : Scientist-D

Institute Name : CSGRC, Hosur.

Institute : CSGRC, Central Silk Board,
PB-No-44, Thally Road
Hosur 635 109 (Tamil Nadu)

Telephone : Office-04344 – 221148
Mobile-9245482460

Date of Birth : 01.06.1967

Sex : Female

EDUCATIONAL QUALIFICATIONS:

HIGHEST DEGREE	YEAR	UNIVERSITY	OGPA (%) Marks obtained	SUBJECT
B.Sc. (Agriculture)	1988	TamilNadu Agricultural University, Coimbatore	3.91/4.00(88.9%)	Agriculture
M.Sc. (Agriculture)	1990	TamilNadu Agricultural University, Coimbatore	4.00/4.00(90.0%) Passed Agricultural Research Service written Examination and received NET (National Eligibility Test) certificate.	Agricultural Entomology

EXPERIENCE :

ORGANISATION/ INSTITUTE	CAPACITY	YEAR	SUBJECT /AREA	Significant achievement
Spices Board project, TNAU, Coimbatore	SRF	1 year	Pesticide Residue Lab.	Anaylsed pesticide residue levels in Spices using Gas Liquid Chromatography (GLC)

REC, Krishnagiri/CSRTI, Mysore	SRA/SRO	11 years 1992 to 2003	Research and Extension	<p>a) Conducted 7 on Farm trials</p> <p>b) Conducted 2 AICE projects, BSTD Project, INM/IPM Project.</p> <p>c) Maintained REC farm (Mulberry garden and farm Rearing).</p> <p>d) Conducted seminars, group discussions, field days, film shows and Krishimelas on sericulture as per the target.</p>
CSGRC, Hosur	SRO/Sci-C/ Sci-D	12 years (2003 to till date)	Bivoltine and mutant silkworm germplasm conservation	<p>➤ Evaluated and Conserved 365 bivoltine accessions and 20 mutant genetic stocks and updated the database for important economic characters.</p> <p>➤ Identified promising bivoltine breeds for high temperature and high humidity conditions (autumn season) for Northern India through collaborative project.</p> <p>➤ Reduced crop cycle of 20 mutant genetic stocks from three to two per year.</p>

Publications:

- Research articles-27, Popular articles-7, Book chapters-3, Seminar abstracts-28 Manual-1, Catalogue-1, Brochure-1 and CD.
- Seminars /workshops participated-30.
- Training attended-7.
- Imparted training-about 3000 farmers.
- Awards-2.
- Membership-2.

BIO-DATA OF CO-INVESTIGATOR

Name : Dr. Veeranna Gowda
 Date of Birth : 05.05.1962
 Sex : Male
 Education :

Degree	Name of the University/ Institute	Subject	Year of Passing	Class
M.Sc.,	Bangalore University, Bangalore	Zoology (Cytogenetics)	1986	First Class
JRF, SRF and Research Assistant	Dept. of Zoology, Bangalore University, Bangalore	1986 to 1989,	UGC Project,	
Senior Research Assistant	NSSO, CSB, Bangalore	1989 to 1999	Commercial Seed production	
Senior Research Officer	SSPC, NSSO, Bangalore / Vijayapura	1999 to 2006	Commercial Seed production.	
Scientist-C	SSPC, Vijayapura / Hosur, CSR&TI, Mysore CSGRC, Hosur	2006-2014	Silkworm seed production, Ph. D studies & SWGR conservation.	
Ph.D.	University of Mysore, Mysore	“Studies on bivoltine hybrids of Silkworm <i>Bombyx mori</i> L., by single, three-way and four-way crossing pattern”.	2013	Awarded

Publications (Numbers only): Research Papers: 32 (including International/National Journals, Seminars / Conferences / Workshops), Reports: 08 Research Progress Reports, Books: 02, Patents: 01, Others: Nil.

Specialized Training:

1. Grainage, disease management and egg hibernation schedules,
2. Maintenance of qualitative and quantitative parameters in commercial multibivoltine and bivoltine hybrid seed production.
3. Silkworm breeding and maintenance at CSRTI, Mysore.

BIO-DATA OF CO-INVESTIGATOR

- 1. Name** : Anuradha H. Jingade
2. Designation : Scientist-D
3. Department/Institute/University: Central Sericultural Germplasm Resources
Centre, CSB, Thally Road, Hosur
4. Date of Birth : 18.01.1963
5. Sex : Female
6. SC/ST : --
7. Education : M.Sc; B.Ed

Sl.No	Institute/place	Degree Awarded	Year
1	University of Mysore	M.Sc (Zoology)	1985
2	University of Mysore	B.Ed	1987
3	University of Mysore	B.Sc (Chemistry, Botany, Zoology)	1983

8. Research Experience in various Institutions:

Sl. No.	Institute	Period
1	Central Sericultural Germplasm Resources Centre, Hosur, Central Silk Board	2009 to date
2	Seribiotech Research Laboratory, Bangalore, Central Silk Board	2001-2009
3	Silkworm Seed Technology Laboratory, Bangalore, Central Silk Board	1992-2001
4	Silkworm Seed Production Centre, K.R. Nagar, Central Silk Board	1990-1992
5	Central Sericultural Research and Training Institute, Mysore, Central Silk Board	1989-1990

9. Publications:

Research Papers: 18
International: 13
National: 5
Reports: 11
Patents: Nil

PART VII: BIODATA OF CO-INVESTIGATOR

Name : Dr. Nivedita S
Designation : Scientist-D
Date of Birth : 26.06.1966
Total no. of years of service : : 24 years
Present place of work : Central Sericultural Germplasm Resources Centre,
Central Silk Board (Govt. of India), P. B. 44 Thally
Road, Hosur, Tamil Nadu. Pin - 635109.
Phone : 04344-221148 , FAX - 04344 - 220520
e-mail: nive_cstri@rediffmail.com

Educational Qualification

Name of the University/ Institute	Degree	Year of Passing	Specialized Subject	Class
Bangalore University	B.Tech (Textiles)	1989	Textile technology	First with Distinction
Visweshwaraya Technical University, Belgaum. Karnataka	M.Tech (Textiles)	2004	Textile Technology	First with Distinction
-do-	Ph.D	2012	Silk Technology	Awarded

Experience:

- ☐ 1989-90 joined SWAN SILKS Pvt. Ltd., Bangalore, an export house as a Textile Designer for 1 year.
- ☐ Joined the LAXMI MILLS, Coimbatore as Textile Designer and worked from June 1990 to Dec. 1990.
- ☐ Joined CSB as SRA on 21/1/1991. Posted at SC&TH, Bangalore. Initialized raw silk testing activities. Developed methodology and system for testing Indian silk at par with Inter National Standards.
- ☐ Posted to TTL, CSTRI, Bangalore during 1997 till April 2012. Worked as Technical Manager in Physical Testing Laboratory and later as Quality Assurance Manager and actively involved in laboratory accreditation of TTL as per ISO 17025 standards.
- ☐ Posted to CSGRC, Hosur during May, 2012 and working as Incharge of Reeling Section, till date.

List of Publications:

Research papers : 12, Popular articles 10, Manuals 06, Technical Reports : 03

BIODATA OF PRINCIPAL INVESTIGATOR

1. Full Name (in Block letters): Dr. C.M.KISHOR KUMAR
2. Designation: Scientist-D
3. Department/ Institute/ University: Silkworm Breeding Laboratory-1, CSRTI, Mysore.
4. Address for Communication: SWBL-1, CSRTI, Manadavadi Road, Srirampura, Mysore - 570 008.
5. Date of birth: 20.07.1963
6. Sex: Male

7. Education (Post Graduation onwards & Professional Career):

Name of the University	Degree Passed	Year of Passing	Subjects taken with Specialization
Bangalore University Bangalore	M.Sc	1986	Sericulture
University of Mysore Mysore	Ph.D	2011	Silkworm Breeding*

* Thesis title: “*Development of bivoltine silkworm breeds of Bombyx mori L. with reference to cocoon filament characters*”.

8. Positions Held / Research Experience in various institutions:
[Not required for in-house personnel]

Employer	Designation of the post held	Date of Joining	Date of leaving

9. Memberships/Fellowships: [Not required for in-house personnel]

10. Patents: [Not required for in-house personnel]

11. Publications (Numbers only): **48**

Books: **0**

Research Papers, Reports: i) Research Papers (National Journals) – **11**
ii) Research Papers (International Journals) – **06**
iii) Research Articles – **05**
iv) Presented in Seminars – **16**
v) Presented in Conferences/Congress – **08**

General articles: **02**

BIO DATA OF CO –INVESTIGATOR

1 Name : Soudaminy.P.V.
2.Designation : Scientist- C
3.Institute : CSRTI, Mysore
4. Telephone : Office .-08212903153
Mobile -9446625336
5. Date of Birth : 05.05.1967
6. Sex : Female
7. Education : M.Sc, B.Ed

Sl.No	Institute/Place	Degree awarded	Year
1.	University of Calicut	M.Sc Zoology (Entomology)	1990
2.	University of Calicut	B.Ed (Natural science)	1991

Experience :23 years in Sericulture Extension

Sl.No	Institute/Office	Period
1.	SSPC Malavally	012.02.92 to 31.10.1992
2.	REC Kanjirapally	1.11.92 to 31.04.1996
3.	REC Angamaly	1.05.96 to 18.-7.2010
4.	REC Sub Unit Kalpetta	19.-7.2010 to 10.05.2015
5.	CSRTI Mysore	11.05.2015 to till date

Training attended : 04

Imparted training : i) Faculty for Sericulture and Sericulture Economics
for 4 years to Govt. higher secondary vocational students in Kerala.

ii) About 300 farmers and about 100 DOS officials and 35 Village
Extension Officers

Bio- data of DR. ANIL KUMAR VERMA Sc-D

1.	Full Name (in Block letters)	DR. ANIL KUMAR VERMA
2.	Designation	Scientist-D.
3.	Department/Institute/University	Silkworm Breeding Section, Central Sericultural Research & Training Institute, Berhampore(WB)-742101
4.	Date of birth	28.12.1960.
5.	Sex	Male.

6. Education (Post Graduation onwards & Professional careers)

Name of the University	Degree passed	Year of passing	Subjects taken with specialization	Class / Division
1. University of Kalyani, Nadia, West Bengal.	M.Sc.	1983	Zoology, Spl.: Entomology.	I
2. Bidhan Chandra Krishi Viswavidyalaya, West Bengal	Ph. D	1990	<u>Title of the Thesis</u> - Studies on whitefly as vector of plant viruses in West Bengal.	-

7. Awards: [Not required for in-house personnel] Not applicable

Year	Award	Agency	Purpose	Nature

8. Position held/research experience in various Institutions: [Not required for in-house personnel]

Employer	Designation of the post held	Date of joining	Date of leaving

9.	Memberships/Fellowships: [Not required for in-house personnel]	
10.	Patents: [Not required for in-house personnel]	
11.	Publications (numbers only)	19 Papers and 35 Technical Reports
	List of important publications whose contents can be used in the proposed area of work	

Bio- data of Zakir Hossain, Sc-C

1. **Name** : Zakir Hossain
2. **Official Designation** : Scientist-C
3. **Official Address** : Central Sericultural Research & Training
Institute, Central Silk Board, Govt. of India,
Berhampore - 742 101, Murshidabad, West Bengal.
4. **E-mail ID** : zakirayub@yahoo.com
5. **Date of birth** : 22.12.1962
6. **Academic Qualification** :

(Post graduation onwards)

Sl.No	Institution Place	Degree Awarded	Year	Specialization
1	Calcutta University, West Bengal	M.Sc.(Zool.)	1987	Entomology

7. Working experiences:

Sl. No	Name of Employer	Designation	Designation		Nature of duty
			From	To	
1	Central Silk Board	SRA	01.02.1991	31.01.2001	Applied research in mulberry & Extension & muga
2	Do	SRO	01.02.2001	29.08.2006	Research & Extension in muga & eri
3	Do	Sc-C	30.08.2006	Continuing	Extension in muga & eri; Research, Teaching & Training in mulberry

8. Publications :

- Research Papers : 6 (International- 1; National: 5)
- Extended Summaries : 1
- Abstracts in seminars etc. : 5
- Book/Book chapters : 1
- Technical Manual/Brochure : 10
- Technical Reports : 3

Patenting & Commercialization :

- As a co-inventor, **commercialized “SERICILLIN”** a bed disinfectant with 2(two) private entrepreneur Saha Resham Enterprise and M/s Nabagram Resham Shilpa Unnayan Co-operative Society Ltd., from Dist. Murshidabad, West Bengal.
- **Applied for patenting with NRDC New Delhi** which is under process.

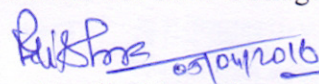
PART VI: DECLARATION / CERTIFICATION (For CSGRC, Hosur)

It is certified that:

- a. The research work proposed in the project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
- b. The same project has not been submitted to any other agencies for financial support.
- c. The emoluments for manpower proposed are those admissible to persons of corresponding status employed in the institute (Annexure-III),
- d. Necessary provision for the project will be made in the institute in anticipation of the sanction of the scheme.
- e. If the project involves the utilization of genetically engineered organism. It is agreed that we will ensure that an application will be submitted through our institutional bio-safety committee and we will declare that while conducting experiments, the bio-safety and guidelines of the Institute would be followed *in toto*.
- f. If the project involves field trials/experiments/exchange of specimens etc. we will ensure that ethical clearances would be taken from the concerned ethical committees/competent authorities and the same would be conveyed before implementing the project.
- g. It is agreed by us that any research outcome or intellectual property right(s) on the invention(s) arising out of the project shall be taken in accordance with the instructions issued with the approval of the Ministry of Finance, Department of Expenditure, as contained in annexure-V.
- i. We agree to accept the terms and conditions as enclosed in Annexure- IV. The same is signed and enclosed.
- h. This institute agrees that the equipment, the basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigators through out the duration of the project.
- j. The institute assumes to undertake the financial and other management responsibilities of the project.

1. Signature of Project Co-coordinator (Applicable for inter-institutional Projects only) Institute with Seal.

Date: 05.4.2016


05/04/2016

(Dr. PRADEEP KUMAR MISHRA)

निदेशक / DIRECTOR

के.रे.ज.सं.के., कोरबा, होसूर- 635 109 (त.ना.)
C.S.G.R.C., CSB, HOSUR - 635 109 (T.N.)

2. Signature of Principal Investigator.

Date: 05/4/16

(M. MUTHULAKSHMI, Sci-D)

3. Signature of Co- Investigator.

(Dr. Veeranna Gowda)
Date: 5/4/16

4. Signature of Co- Investigator.

(Smt. Anuradha H. Jengade)
Date: 5/4/2016 Sci-D

5. Signature of Co- Investigator.

Dr. S. Nivedita, Sci-D

PART VI: DECLARATION / CERTIFICATION(CSRTI,Mysore)

It is certified that:

- i. The research work proposed in the project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
- j. The same project has not been submitted to any other agencies for financial support.
- k. The emoluments for manpower proposed are those admissible to persons of corresponding status employed in the institute (Annexure-III),
- l. Necessary provision for the project will be made in the institute in anticipation of the sanction of the scheme.
- m. If the project involves the utilization of genetically engineered organism. It is agreed that we will ensure that an application will be submitted through our institutional bio-safety committee and we will declare that while conducting experiments, the bio-safety and guidelines of the Institute would be followed *in toto*.
- n. If the project involves field trials/experiments/exchange of specimens etc. we will ensure that ethical clearances would be taken from the concerned ethical committees/competent authorities and the same would be conveyed before implementing the project.
- o. It is agreed by us that any research outcome or intellectual property right(s) on the invention(s) arising out of the project shall be taken in accordance with the instructions issued with the approval of the Ministry of Finance, Department of Expenditure, as contained in annexure-V.
- i. We agree to accept the terms and conditions as enclosed in Annexure- IV. The same is signed and enclosed.
- p. This institute agrees that the equipment, the basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigators through out the duration of the project.
- k. The institute assumes to undertake the financial and other management responsibilities of the project.

1. Signature of Project Co-coordinator
Institute with Seal.
Date:

18/12/15
डा. वी. शिवप्रसाद/Dr.V.SIVAPRASAD
निर्देशक /Director
केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
Central Sericultural Research and Training Institute
(केंद्रीय रेशम बोर्ड-भारत सरकार)
Central Silk Board-Govt. of India)
मैसूर/MYSORE-570008

2. Signature of Principal Investigator.
Date:

Dr. C.M. KISHAN LUNAR
Sci-D, SWBL, BBL, CSRTI, Mysore.

3. Signature of Co- Investigator.

Date:

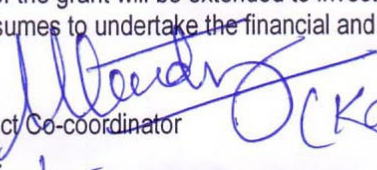
Soudamini P.V.
Sci-c, SWBL, BBL, CSRTI, Mysore

PART VI: DECLARATION / CERTIFICATION(CSRTI, Berhampore)

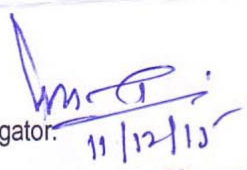
It is certified that:

- a. The research work proposed in the project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
- b. The same project has not been submitted to any other agencies for financial support.
- c. The emoluments for manpower proposed are those admissible to persons of corresponding status employed in the institute (Annexure-III),
- d. Necessary provision for the project will be made in the institute in anticipation of the sanction of the scheme.
- e. If the project involves the utilization of genetically engineered organism. It is agreed that we will ensure that an application will be submitted through our institutional bio-safety committee and we will declare that while conducting experiments, the bio-safety and guidelines of the Institute would be followed *in toto*.
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- g. It is agreed by us that any research outcome or intellectual property right(s) on the invention(s) arising out of the project shall be taken in accordance with the instructions issued with the approval of the Ministry of Finance, Department of Expenditure, as contained in annexure-V.
- h. We agree to accept the terms and conditions as enclosed in Annexure- IV. The same is signed and enclosed.
- i. This institute agrees that the equipment, the basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigators through out the duration of the project.
- j. The institute assumes to undertake the financial and other management responsibilities of the project.

1. Signature of Project Co-coordinator
Institute with Seal.
Date: 11/12/15


(Kamika Tripathy)

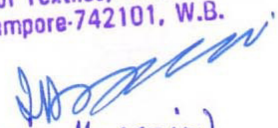
2. Signature of Principal Investigator.
Date: 11/12/15


Dr. A. K. Verma, M.Sc., Ph.D.
Scientist-D
CSR & TI, Central Silk Board
Ministry of Textiles, Govt. of India
Berhampore-742101, W.B.

Director
Central Sericultural Research
and Training Institute
Berhampore-742 101

3. Signature of Co- Investigator.

Date:


(Zakir Hossain)

PART VI: DECLARATION / CERTIFICATION (CSRTI,Pampore)

It is certified that:

- y. The research work proposed in the project does not in any way duplicate the work already done or being carried out elsewhere on the subject.
- z. The same project has not been submitted to any other agencies for financial support.
- aa. The emoluments for manpower proposed are those admissible to persons of corresponding status employed in the institute (Annexure-III),
- bb. Necessary provision for the project will be made in the institute in anticipation of the sanction of the scheme.
- cc. If the project involves the utilization of genetically engineered organism. It is agreed that we will ensure that an application will be submitted through our institutional bio-safety committee and we will declare that while conducting experiments, the bio-safety and guidelines of the Institute would be followed *in toto*.
- dd. If the project involves field trials/experiments/exchange of specimens etc. we will ensure that ethical clearances would be taken from the concerned ethical committees/competent authorities and the same would be conveyed before implementing the project.
- ee. It is agreed by us that any research outcome or intellectual property right(s) on the invention(s) arising out of the project shall be taken in accordance with the instructions issued with the approval of the Ministry of Finance, Department of Expenditure, as contained in annexure-V.
- i. We agree to accept the terms and conditions as enclosed in Annexure- IV. The same is signed and enclosed.
- ff. This institute agrees that the equipment, the basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigators through out the duration of the project.
- m. The institute assumes to undertake the financial and other management responsibilities of the project.

1. Signature of Project Co-coordinator (Dr.S.P.Sharma, Director, CSRTI, Pampore)

Name of the Institute with Seal

Date:

2. Signature of Principal Investigator. (Dr.Babulal, Scientist-D, CSRTI,Pampore)

Date :

3. Signature of Co- Investigator(Dr.D.Guruswamy ,Scientist-C, CSRTI,Pampore

Date: