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वार्षिक प्रतिवेदन 2000-2001

Annual Report 2000-2001

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राँची - 834 010, झारखण्ड, भारत

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Front Cover : Pedal-operated lac scraping machine; sole plate of electric iron coated with shellac-based insulating varnish and introduction of beneficial parasitoids in lac insect culture (clockwise, from top)

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EXECUTIVE SUMMARY
PREFACE



This year witnessed a number of events organised at this Institute to mark the conclusion of the Platinum Jubilee of its foundation. The former Directors of the Institute, whose hard work and leadership have led to building up of a glorious legacy of this unique institute, were felicitated by the Hon. Union Minister for Agriculture, Shri Nitish Kumar, in a glittering ceremony. Shri Birsa Oraon the oldest living worker of the institute was also honoured on this occasion. Dr. B. L. Amla, Chairman of RAC, who was kind enough to grace the occasion, enjoyed distributing specially designed mementoes among all the employees in service. Dr. P. Kumar, Principal Scientist and Head, Lac Production Division and Shri R. Ramani, Senior Scientist, TOT Division were also honoured with special mementoes for their distinguished services.

A special cultural programme was organised by the children of the staff, at a staff Get-together in the evening on 21st September. Cutting the birthday cake of the Institute turned out to be a memorable moment for me.

Starting on the Foundation Day, a two-day symposium on 'Lac on the New Millennium' was also organised, the inaugural ceremony of which was attended by a number of dignitaries. The deliberations made by the experts during two-days have led to a number of recommendations for building a strong lac industry.

Retrospective introspection at such moments evokes mixed responses in one's mind. Instead of invoking a sense of achievement, it rather inspires one for focussing the energies for aiming higher goals.

Leadership determines the performance of any organisation. The Institute underwent organisational restructuring, administrative reforms and infrastructural development under the able stewardship of Former-Director Dr. S. C. Agarwal, who retired on December 31, 2000. The Institute would always remember his contribution to the development of the institute.

Dr. KK Kumar
Dr KK Kumar
 Director



Dr. S. C. Sengupta, Former-Director, being felicitated



Dr. B. L. Amla giving away memento to ILRI employee



Felicitations of Dr. S. C. Agarwal at retirement

EXECUTIVE SUMMARY

The Indian Lac Research Institute is the premier R&D institute exclusively devoted to lac. During the period under report, the Institute celebrated the Platinum Jubilee of its foundation, on 20th September, the foundation day of the institute. Hon'ble Shri Nitish Kumar, Union Minister for Agriculture, Dr. A. Alam, DDG (Engg.) ICAR and a no. of dignitaries attended the function.

During the past seventy five years of dedicated service to the nation, the Institute has developed a number of technologies in the areas of lac production, host plant management, lac processing, value addition and diversification of uses of lac. The Institute has been instrumental in solving the problems and needs of the lac cultivators, lac based industries and has been providing research support for increasing lac production and its utilization.

Research

The research projects of the institute are mainly organized under four core programmes in two research divisions : Lac Production and Lac Processing & Product Development. A summary of salient achievements made by these divisions during the period under report, is given below :

Lac Production

- Removal of tertiary shoots during October and spraying of water in April-May increased the survival of *kusmi* lac crop on *ber*, during summer.
- Field releases of *Trichogramma chilonis* @ 50, 75 and 100 insects per *palas* tree and *T. pretiosum* @ 10, 15 and 20 insects per bush of *bhalia* at the 3rd, 4th, 9th and 10th week after inoculation have resulted in a significant reduction in the population of the predators, *Eublemma amabilis* (50 - 84%) and *Pseudohypatopa pulvereana* (57 - 91%). Release of 100 insects of *T. chilonis* on lac bearing *palas* trees gave 239% more broodlac yield than that of control.
- Eggs of *E. amabilis* dipped in endosulfan (62.5 ppm) and ethofenprox (100, 50 and 25 ppm) resulted in cent percent mortality of the eggs, whereas under field condition, ethofenprox (@ 0.005 to 0.02%) caused significant mortality of *E. amabilis* larvae.
- Values of almost all the growth characters were found to be higher in *F. macrophylla* than those of *F. semialata* recorded prior to lac inoculation for winter lac crop (*aghani* 2000-01). The rate of increment in plant height was 0.51 and 2.20 cm/day in *F. macrophylla* and 0.24 and 1.20 cm/day in *F. semialata* during 80 DAC (days after coppicing/harvesting) and 80-150 DAC respectively. Similarly, the rate of increment in basal girth was found to be 0.026 and 0.020 cm/day during 80 DAC in *F. macrophylla* and 0.013 cm/day during 80-150 DAC in *F. semialata*. French bean gave better returns compared to other vegetable crops tried in the system as inter crop.
- A prediction model for yield of broodlac, sticklac and biomass from *akashmani* (*Acacia auriculaeformis*) has been developed for winter *kusmi* lac (*aghani* 1999-2000) through correlation and regression analyses. Independent variables could explain 62.70 and 90 % variation for broodlac, sticklac and biomass yields respectively.
- Out of total available shoot length of primary and secondary twigs of *akashmani*, only 26.0% of shoot length was preferred by lac larvae for their settlement, Out of this length only 31.6% of shoot length had significant lac encrustation. The suitable girth of twigs for thick lac encrustation was found to be 2.37-3.38 cm for winter lac crop.
- Significant reduction in the population of both the predators, *Eublemma amabilis* and *Pseudohypatopa pulvereana*, by about 50-75% and 57-83%, respectively over control has been recorded by release of egg parasitoids. Release rate of 100 parasitoids per tree was



Paratachardina sylvestrii
on bhalla

found most suitable for *katki* crop on *palas*.

- Under laboratory conditions, the ectoparasitoid *Bracon hebetor* could parasitise, 58% larvae of *Pseudohypatopa pulverea* while feeding on artificial diet.
- The insecticides dichlorvos (0.03%) and ethofenprox (0.01%) did not

have any adverse effect on the parasitoid *Bracon hebetor*. However, endosulfan (0.05%) proved to be highly detrimental as it caused 100% mortality within 24 hrs. of treatment.

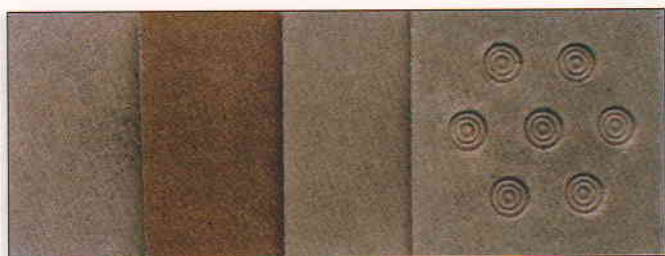
- *Flemingia stricta* has shown superior performance in respect of producing number and length of inoculable shoots/bush with 91 and 57% heritability and 16.8 and 6.3% genetic advance, respectively.
- The trivoltine crimson lac insect has been showing shifting life cycles for the last eleven generations since its introduction under Ranchi climate.
- Lac insects collected from Bangalore (Karnataka), Thrissur (Kerala), Ajmer (Rajasthan) and Amsoi (Naogaon, Assam) were added to the existing insect germ plasm and are being maintained on *Flemingia macrophylla* under potted conditions. Lac insects collected from Amsoi (Assam), Chitradurga (Karnataka) and Palakkad (Kerala) indicated heavy infestation of the predator *Eublemma amabilis*.
- A roller-type pedal-operated lac scraping machine, with a capacity of about 6 kg lac sticks at 95% efficiency, has been designed and fabricated.



Pedal-operated lac scraping machine

Lac Processing and Product Development

- (Z)-9 Hexadecen-1-al, a sex pheromone component was synthesized from *threo*-aleuritic acid. It was evaluated by blending it with (Z)-11-hexadecen-1-al on *Helicoverpa armigera*. It caught 23 adult males of *H. armigera* in three days.
- 1,9-Nonane diol diacetate, a mosquito repellent has been synthesised from aleuritic acid. Its repellent activity is being tested.
- (E)-2 undecene-1,11-diol diacetate has been synthesized from aleuritic acid. The compound is expected to exhibit mosquito repellent activity.
- A heat and water proof shellac varnish, two shellac based tin can lacquers and one hot melt adhesive composition were prepared.
- Electrical properties of baking type insulating varnishes prepared by blending of solutions of gummy mass and a synthetic resin and also by melt-mixing, were investigated. The films of the varnishes possessed high dielectric strength, when tested both in the air and after immersion in water for 24 hrs. and showed thermal resistance up to 240° C besides resistance to tracking and transformer oil.
- A few emulsion formulations based on lac wax and bleached lac have been prepared for use



Lac-based particle boards

as a protective coating for fruits and vegetables. Attempts were also made for preparation of general purpose polishing compositions based on lac wax and other ingredients.

- The woody waste material of lac factory was successfully used in making particle boards of good surface finish by three-layer mat formation technique. It was further found that the aleuritic acid-free gummy mass could be used in combination with phenol-formaldehyde resin as extender for making particle board.
- Several compositions of insulating varnishes based on shellac and two/three synthetic resins were studied for their electrical and other properties as per IS: 10026-1982. The varnishes possessed all the desired characteristics e.g., dielectric strength, resistance to tracking and transformer oil. The films of the varnishes were flexible and passed the test for thermal resistance up to 240°C. Two of the varnishes were found to be satisfactory when applied on the coils of 6.6 kV 750 kW and 3.3 kV 400 HP electric motors.



Electric motor applied with shellac-based insulating varnish

Transfer of Technology

Training & Transfer of Process Knowhows

The Transfer of Technology Division conducted a number of training programmes for farmers, students, trainees, probationers and entrepreneurs on different aspects of lac which have been summarised below:

- Seventy-nine farmers (8 batches) were given one-week training on lac culture and related aspects. A batch of 22 B.Sc. (Ag) students of BHU, Varanasi also received a special one week training on lac.
- More than 800 farmers participated in a number of off-campus/on-farm training programmes organized in Jharkhand, Chhatisgarh and Orissa.
- One - day Orientation Programme on lac was also conducted for the benefit of 482 farmers and 102 students, in 19 batches.
- A batch of 25 trainees, sponsored by Institute of Entrepreneurship Development, Bihar was given training on selected lac based enterprises.
- Technology for lac dye was transferred to one entrepreneur.
- MoUs have been signed between ILRI and two private agencies, viz., M/s Tajna Shellac Pvt. Ltd., Khunti and Encon, Ranchi for the transfer of technology of recently developed insulating varnish compositions for promotion in foreign market.

Publicity

- The Institute participated in twelve exhibitions / *kisan melas* to promote lac and lac technologies developed at the institute.
- Eleven publications and six promotional posters were brought out. ILRI Newsletter, a quarterly publication was also brought out regularly. Old publicity literature were also reprinted in large numbers and distributed on various occasions.

Extension Research

- Current status and problems of some of the lac processing units of West Bengal,



Release of Souvenir by Hon'ble Agric. Minister, Shri Nitish Kumar

Chhatisgarh and Maharashtra were assessed through a survey.

- A survey was made in some lac growing areas of Jharkhand, West Bengal and Orissa to collect data pertaining to lac culture.

Organising National Symposium

A two-day national symposium on "Lac in the New Millennium" was organised at the Institute to commemorate the Platinum Jubilee of Foundation of the Institute. It was inaugurated by Hon'ble Union Agriculture Minister, Shri Nitish Kumar in a well-attended ceremony. A number of publications were released during the occasion. There were about 140 participants.

HRD

The following scientists were deputed for training in the 72nd Foundation Course for Agricultural Research Service (72nd FOCARS) at National Academy of Agricultural Research Management, Hyderabad from 1st December 2000 to 30th March, 2001.

- Sri Saroj Kumar Giri (ASPE)
- Sri Santosh Kumar Singh Yadav (Org. Chem.)
- Sri Dipnarayan Saha (Biotech.)
- Sri Arvind Kumar (SWCE)

Dr. K.K. Sharma, Scientist (Sr. Scale) participated in the winter school on, 'Emerging trends in microbial control of crop pests from 14th November to 13th December, 2000 organized by Department of Entomology, Tamil Nadu Agricultural University, Coimbatore.

Dr. A.K. Jaiswal Scientist (Sr. Scale)

completed two week training programme on "Statistical softwares for data analysis" during April 4-15, 2000 conducted by National Academy of Agricultural Research and Management, Hyderabad.

Dr. P.C. Sarkar, Scientist, attended a two week training programme on "Web programming and Internet Technologies" from 9th October to 21st October 2000, conducted by Indian Agriculture Statistical Research Institute, New Delhi.

Infrastructure Development



Inauguration of mist chamber by Dr. R. P. Kachru, ADG (PE)

A mist propagation chamber (15m x 5m), capable of maintaining temperature and humidity over a wide range has been constructed. Dr. R P Kachru, ADG (PE), ICAR inaugurated the facility on April 7, 2000.



Exhibition Van

A specially designed Exhibition Van, capable of carrying exhibition kit, audio-video equipment and generator set has been procured for publicity purposes.



Anwar Alam DDG (Engg.) and Dr. R. P. Kachru, ADG (PE) at the Sophisticated Instrument Laboratory

The Sophisticated Instrument Laboratory of the LP & PD Division was inaugurated by Dr. Anwar Alam, DDG (Engg.), ICAR on 19th September 2000 on the occasion of Platinum Jubilee celebrations of the ILRI. Dr. R. P. Kachru ADG (PE), ICAR and Dr. B. L. Amla, Chairman, RAC were also present on the occasion.

Resource Generation

The Institute has earned a revenue of about Rs. 9.81 lakhs through training, services, sale of products, sale counter etc. during the period.

Award

Dr PC Sarkar, Scientist, lac processing and Product Development Division was presented with the Dr K A Thakkar (Cash) Award of Rs. 1000/-. Two of his research papers entitled, FT-IR Spectroscopic studies on esterification of lac'

and, 'FT-IR studies on bleaching of shellac' co-authored by Dr AK Srivastava of Ranchi University and published in the Journal of the institution of Chemists (India), Vol. 70, 1998 were selected as the best papers published in the Journal in 1998.

Sports

The ILRI Sports team participated in the ICAR Zone-I Sports Meet, organised by IISR, Lucknow during 22 - 25 February 2000. The team consisting of 38 members was led by Dr. A. Bhattacharya as Chief-de-Mission and Mr. Binod Kumar as team manager. The ILRI team was runner-up in football. Mr. R. C. Mandap finished second in the 200, 400 and 1500 m race events. Mr. Bandhnoo Oraon won Silver in high jump. Mr. Arjun Gope was third in discus throw. The relay team comprising of Mr. R. C. Mandap, Louis Ekka, Kameshwar Oraon and Bandhnoo Oraon won Bronze in 4 x 100 relay race.



Winners of sports events with Director



A specially designed Exhibition Van, capable of carrying exhibition kit, audio-visual equipment and generator set has been procured for publicity purposes.

Dr. A.K. Sarkar, Scientist (Sr. Scale) participated in the winter school on 'Emerging trends in microbial control of crop pests from 14th November to 13th December, 2000' organised by the Department of Entomology, Tamil Nadu Agricultural University, Coimbatore.

- Dr. A.K. Sarkar, Scientist (Sr. Scale)
- Dr. R.C. Mandap, Scientist (Sr. Scale)
- Dr. B.L. Amla, Chairman, RAC
- Dr. P.C. Sarkar, Scientist
- Dr. K.A. Thakkar, Scientist
- Dr. A. Bhattacharya, Chief-de-Mission
- Mr. Binod Kumar, Team Manager
- Mr. R.C. Mandap, Runner-up in 200, 400 and 1500 m race events
- Mr. Bandhnoo Oraon, Silver in high jump
- Mr. Arjun Gope, Third in discus throw
- Mr. R.C. Mandap, Louis Ekka, Kameshwar Oraon and Bandhnoo Oraon, Bronze in 4 x 100 relay race

INTRODUCTION

Historical

The Institute came into existence as a result of the recommendation of a two-member committee comprising of Mr. H. A. F. Lindsay and Mr. C. M. Harlow, appointed early in 1920 by the then Govt. of India to enquire into the conditions of the Indian lac trade and suggest measures for its all-round improvement. The report of the committee was published in 1921. They had recommended, besides other aspects, for intensive cultivation by significantly tested methods for sustained lac production. In view of this suggestion, the then lac merchants organised themselves into a private registered body, the Indian Lac Association for Research. The association acquired land from the provincial government and the foundation of the Indian Lac Research Institute (ILRI) was laid on Sept. 20, 1924. It started functioning under the Founder Director, Mrs. Dorothy Norris.

Initially, the Institute consisted of Entomological Section as the principal unit supported by a Biochemical Section which started functioning from 1925. Subsequently in 1927, a Physico-chemical Section was added to take up applied research. Later, these two chemical sections were combined to form a Chemical Division. The scope of this Institute was thus widened to cover both the entomological and chemical aspects.

In 1930, on the recommendations of the Royal Commission for Agriculture, the Indian Lac Cess Act was passed by the Central Legislature. Under this Act, the Government of India constituted the Indian Lac Cess Committee which took over the Institute from "Lac Association" in 1931.

After the Second World War, the First and Second Review Committees set up in 1951 and 1956, formed broad research programmes with equal emphasis on fundamental and applied research. During the period, four Regional Field Research Stations were set up at Jhalda (W.B.), Damoh, Umaria (M.P.) and Mirzapur (U.P.) to

take up regional problems. Later, Regional Testing Laboratories were also established to support lac manufacturers for quality control of different types of lac manufactured by them. These were set up at Gondia (Maharashtra), Jhalda (W.B.) in 1959, at Balarampur (W.B.) and Daltonganj (Bihar) in 1961 and at Namkum (Bihar) in 1962.

Indian Council of Agricultural Research (ICAR) took over the Administrative Control of the Institute on 1st April 1966, with the abolition of the Lac Cess Committee on this day. The Institute was strengthened and reorganized in December 1971, based on the recommendation of Sheshadri Committee, into five Divisions, viz., Entomology, Chemistry, Agronomy & Plant Genetics, Technology and Extension.

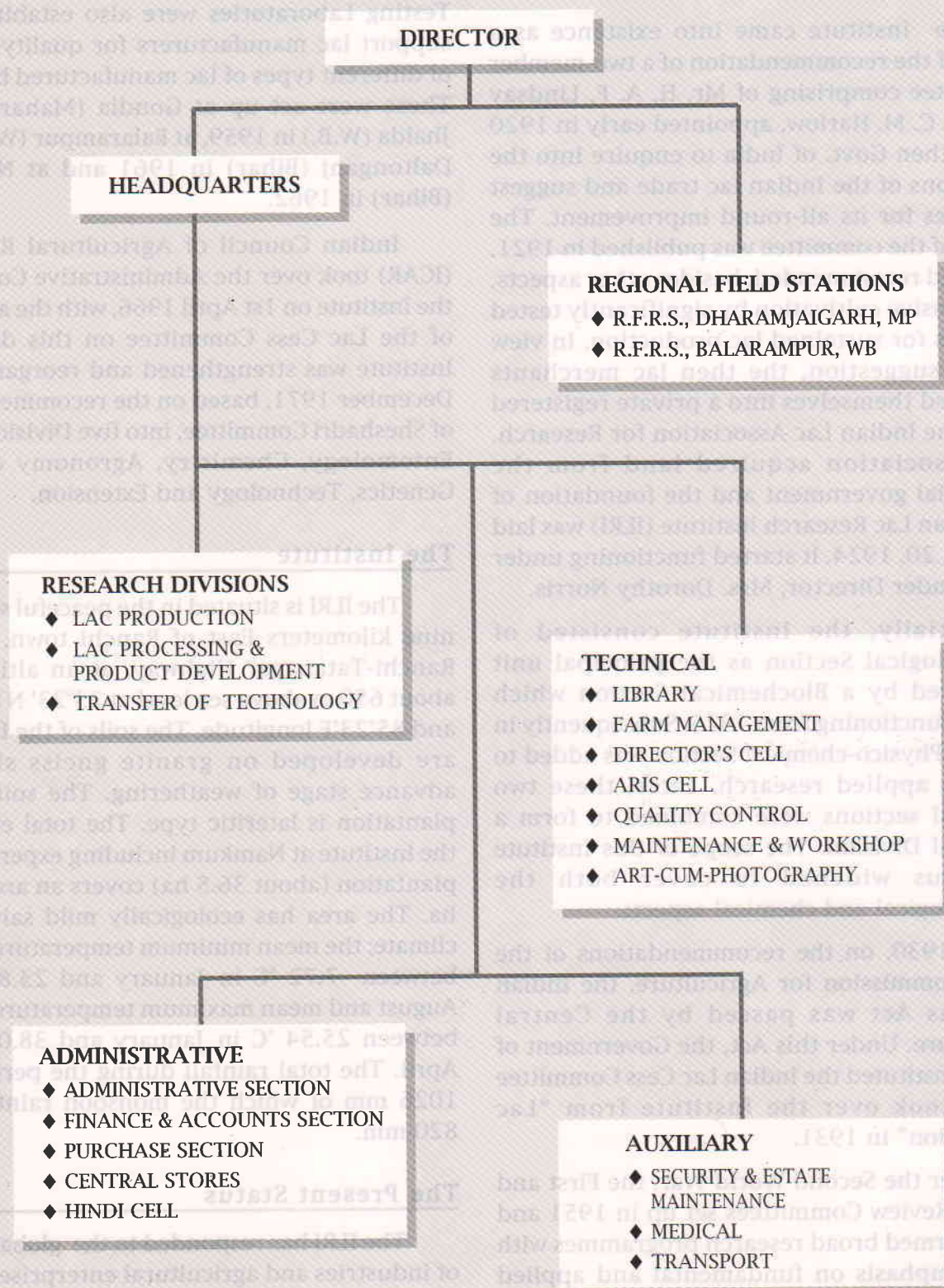
The Institute

The ILRI is situated in the peaceful suburbs, nine kilometers East of Ranchi town, on the Ranchi-Tatanagar Highway, at an altitude of about 650 m above sea level at 23°23' N latitude and 85°23'E longitude. The soils of the Institute are developed on granite gneiss showing advance stage of weathering. The soil of the plantation is lateritic type. The total estate of the Institute at Namkum including experimental plantation (about 36.5 ha) covers an area of 49 ha. The area has ecologically mild salubrious climate; the mean minimum temperature varied between 7.72 °C in January and 23.80 °C in August and mean maximum temperature varied between 25.54 °C in January and 38.09 °C in April. The total rainfall during the period was 1026 mm of which the monsoon rainfall was 820 mm.

The Present Status

The ILRI has responded to the globalisation of industries and agricultural enterprises of the country as well as structural and functional reorganisation of ICAR. The Institute also has undergone structural changes and the priorities

ORGANISATIONAL SET-UP



have been redefined. The erstwhile Divisions and Sections have been abolished and the scientific manpower has now been divided into three divisions, viz., Lac Production, Lac Processing and Product Development and Transfer of Technology. The Institute runs two Regional Field Research Stations at Madhya Pradesh and West Bengal. For outstation experiments, areas and trees have been taken on long term lease. Infrastructure development in both physical and manpower has been initiated in a big way. A cell for Agricultural Research Information System (ARIS Cell) provides to the scientists access to the Super-Information Highway for communication and information retrieval.

Since its inception, the Institute has played a significant role in creating awareness among the tribals about the benefit of scientific methods of lac cultivation. It has persistently endeavoured to boost, optimise and disseminate appropriate technologies for scientific methods of lac cultivation and offers packages and practices for all major lac hosts. The Institute has been disseminating these technologies to the growers belonging to weaker sections, who cultivate lac in an area encompassing about 80,000 sq. km covering the states of Jharkhand, West Bengal, U.P., M.P., Maharashtra and Orissa.

The industrial aspects have not been overlooked. The Institute has always polarised its scientific manpower as per the changing demand of the consumer industries. A number of products and processes have been developed. Previously the technologies used to be transferred free of cost to the interested, on request. Now, a nominal fee is charged for the transfer of these technologies with the objective of meeting the target set for resource generation by the Council. The Institute has attained international recognition for its contribution in cultivation and utilisation aspects of lac.

The mandate of the Institute are :

- To develop lac culture technologies, adopting existing or genetically improved lac insects and lac hosts

- To develop lac processing techniques for the industry
- To conduct researches for diversification of lac utilisation leading to pilot plant demonstration
- To transfer the technologies to farmers and entrepreneurs
- To act as a repository of information on lac production, processing and utilisation

For Regional Field Research Stations :

- To test the developed lac cultivation technologies under different agro-climatic conditions
- Brood lac production and exploitation of regional hosts
- Training of farmers for boosting lac production in agro-forestry system
- Entrepreneur awareness programme on regional basis

Organisational Set-up

The Institute is headed by a Director. The scientific manpower is deployed under three Divisions : i) Lac Production, ii) Lac Processing and Product Development and iii) Transfer of Technology.

Located in the main campus are :

The Divisions of Lac Production, Lac Processing & Product Development and Transfer of Technology; the Administrative, Finance & Accounts Sections; the Library; the Director's Cell; ARIS Cell and the Mechanical Section; besides, the Dispensary and residential quarters. Adjoining this, is a small campus housing the Processing Laboratory and staff quarters. The Institute has playgrounds in both the campuses.

The administrative wing comprises of Director's Office, Administrative Section, Purchase Section, Finance and Accounts Section and Central Stores. The technical support is provided by the following sections : Library, Director's Cell, ARIS Cell, Farm Unit and Maintenance & Workshop. The Auxiliary units are : Hindi Cell, Security, Medical and Estate Maintenance services.

Staff

The Institute has a sanctioned strength of 55 scientific, 96 technical, 45 administrative and 112 supporting grade posts.

Budget

During 2000-2001, the non-plan expenditure was Rs. 344.06 lakhs, against a budget estimate of Rs. 430 lakhs, the plan expenditure was Rs. 85.2 lakhs against a budget estimate of Rs. 115 lakhs. The detailed figures are shown in the Table I.

Revenue Generation

During the period under report, a sum of

Rs. 9.81 lakhs was earned as revenue through different programmes of various divisions and sections of the Institute, as per details given in the following table :

Head	Revenue (In lakhs)
Sale of farm produce, product etc.	2.16
Testing charges	0.09
Receipt from service rendered	3.08
Income from internal schemes	1.01
Training and consultancy	1.87
Other receipts	1.60
Total	9.81

Table I Budget during 2000-2001
(in Rs. lakhs)

Head of account	BE : 2000-2001	RE : 2000-2001	Actual expenditure
Plan			
Establishment charges	—	—	—
Wages	—	—	—
OTA	—	—	—
T.A.	3.00	2.80	2.80
Other charges including equipment	53.00	55.20	48.54
Works	10.00	7.00	6.01
Catch-up grant			
Equipment	15.00	11.00	9.97
Works	25.00	19.00	17.88
Other items, HRD	6.00	—	—
Total	115.00	95.00	85.20 (90.00*)
Non-Plan			
Establishment charges	379.80	330.00	269.17
Wages	—	—	—
O.T.A.	0.05	0.05	0.05
T.A.	2.50	2.00	1.98
Other charges including equipment	45.00	52.45	51.43
Works & other items	2.65	22.50	21.43
Total	430.00	407.00	344.06 (385.00*)

* Amount released

RESEARCH ACCOMPLISHMENTS

LAC PRODUCTION DIVISION

EVALUATION AND IMPROVEMENT OF LAC CROP MANAGEMENT PRACTICES UNDER INTEGRATED AGRO-FORESTRY SYSTEM COVERING SOIL, HOST PLANT AND PEST MANAGEMENT

To evolve management practices for kusmi lac production on ber

Determination of the effect of nitrogenous fertilizer on shoot growth and survival of lac insects during summer

As a prerequisite to the nitrogenous fertilizer trial, *ber* trees of the old plantation were pruned and FYM applied to all the trees to initiate the following fertilizer treatments during summer in RBD with five replications.

T₀ (Control) - N₀P₀, T₁-N₂₀ P₅₀, T₂-N₄₀P₁₀₀, T₃-N₆₀P₀, T₄-N₈₀P₅₀ and T₅-N₆₀P₁₀₀. Inoculation and recording of data will be taken up at scheduled time.

Effect of partial pruning and application of GA3 on summer survival of lac crop

The experiment was conducted in RBD with six treatments viz., T1- early variety of lac insects + partial pruning, T2- early variety lac insects + partial pruning + GA3 @ 40 ppm, T3- early variety of lac insects (control) with similar set of treatments with late variety of lac insects as T4, T5 and T6 respectively. Lac insects suffered heavy mortality during summer. All the

replicates under treatments comprising of late variety of *kusmi* lac insects, and the early *kusmi* lac insects which survived in case of partial pruning yielded crop. The ratios of used lac to broodlac and sticklac yield are 1:1.2 and 1:0.82 respectively. Thus, this practice may be tried in combination with other components to enhance the yield ratio.

To determine the appropriate brood rate for summer and winter kusmi crop production on ber

The experiment conducted last year was repeated during *aghani* season with four treatments of brood rates viz., 5, 10, 15 and 20 g/m shoot length. Each *ber* tree represented a treatment replicated five times. All the 20 trees, pruned during April/May last year, were inoculated during July 2000 with *kusmi* late variety. The 15 g/m brood rate resulted in highest brood lac and sticklac production/tree this year also, which may be used for *aghani* crop production on *ber* (Table 1).

Bio-rational approaches for management of pests of lac insect and host plants

Rearing of beneficial parasitoids

Egg parasitoids: Eight egg parasitoids, viz., *Trichogramma pretiosum*, *T. chilonis*, *T. brasiliensis*, *T. japonicum*, *T. dendrolini*, *T. embryophagum*, *Trichogrammatoidea bactrae*

Table 1 Effect of brood rate on coverage and yield of lac on *ber* during *aghani* crop (2000-01) season

Brood rate (g/m)	Mean coverage (%)				Weight of brood lac (g/m)	Yield ratio	
	Primary	Secondary	Tertiary	Total		Broodlac obtained /used	Stick lac obtained /used
5	2.32	14.40	4.20	20.92	55.50	4.55	3.00
10	6.10	17.30	3.20	26.60	80.25	2.40	2.30
15	9.30	28.80	5.20	43.30	120.00	2.80	3.40
20	15.65	25.40	12.00	53.05	98.00	2.20	2.40

and *Telenomus remus* were reared under laboratory condition on *Corcyra cephalonica* eggs. Three egg parasitoids, viz., *T. japonicum*, *T. dendrolini* and *T. embryophagum* brought from Project Directorate Biological Control, Bangalore, were successfully reared under laboratory condition at ILRI, Ranchi for the first time. All the three parasitoids failed to parasitise the eggs of lepidopterous lac predators.

Larval parasitoids : Culture of *Bracon hebetor* (Hymenoptera : Braconidae) recently brought from P.D.B.C., Bangalore was maintained on the larvae of *C. cephalonica*. The parasitising efficiency of the parasitoid was assessed against lepidopterous lac predators under laboratory condition. The parasitoid parasitised 58% larvae of *Pseudohypatopa pulverea* while feeding on artificial diet, similarly 40% larvae of *Eublemma amabilis* were found to be parasitised when exposed through chimney method. Since, the habitat of both the predators was immensely disturbed while testing under laboratory condition, it would be more appropriate if the parasitising efficiency is evaluated under micro-plot or field conditions. Nevertheless, the initial observation indicates that the parasitoid holds promise for the management of both the major lepidopterous predators of lac insects.

Biological control of lac predators by egg parasitoids under field condition

Field release of *Trichogramma chilonis*, *T. pretiosum* and *T. brasiliensis* (by means of trichocards) was carried out respectively, on lac crops grown on *Butea monosperma* (*palas*), *Flemingia macrophylla* (*bhalia*) and *Schleichera oleosa* (*kusum*) during *katki* 2000 and *aghani* 2000-01 crops. The release of *T. chilonis* was @ 50 (T_1), 75 (T_2) and 100 (T_3) insects per tree of *palas* while it was @10 (T_1), 15 (T_2) and 20 (T_3) insects per bush in case of *bhalia* both carrying *rangeeni* crops. Similarly, for *kusmi* crop, the dose of release of *T. brasiliensis* on *kusum* trees was @100 (T_1), 200 (T_2) and 300 (T_3) insects during *aghani* 2000-01 crop season. Altogether four releases were made during 3rd, 4th, 9th and 10th week after inoculation, coinciding with the peak periods of incidence of the predators.

Significant reduction was observed, in the population of both the predators, *Eublemma amabilis* and *Pseudohypatopa pulverea*, by about 50-75% and 57-83% respectively, over control **Table 2**. The overall increase in brood obtained to brood used was 4.24 in case of T_3 , which is 239% more yield as compared to control. Therefore, release rate of 100 insects per tree was found most suitable for *katki* crop on *palas*. In case of *T. pretiosum* released on *bhalia* bushes, a reduction in the population of *E. amabilis* by 76-84% and *P. pulverea* by 72-91% was observed. The brood obtained to brood used was 3.44, 3.64, 3.81 and 1.98 in case of T_1 , T_2 , T_3 and control. There was no significant difference between T_2 and T_3 in predator population as well as broodlac yield (**Table 3**). Hence, release rate of 15 insects/bush (T_2) was found to be economical, which may be recommended for control of lepidopterous predators during *katki* crop season. In case of field release of *T. brasiliensis* on *kusum* trees during *aghani* 2000-01, the results are awaited.

Evaluation of pesticides on lac culture

To assess the effect of pesticides on lac culture and associated insect fauna during the rainy season, one insecticide (endosulfan), one fungicide (carbendazim) and antibiotic (streptomycin) were sprayed in different combinations on one-month-old *katki* 2000 crop raised on *palas* bushes. The experiment was carried out with 13 treatments viz., carbendazim (Bengard) 0.01% (T_1); endosulfan (Thiodan) 0.05% (T_2); streptomycin 50 (T_3), 100 (T_4), 200ppm (T_5); T_1+T_2 (T_6); T_2+T_3 (T_7); T_2+T_4 (T_8); T_2+T_5 (T_9); $T_1+T_2+T_3$ (T_{10}), $T_1+T_2+T_4$ (T_{11}), $T_1+T_2+T_5$ (T_{12}), control (T_{13}) replicated thrice. No significant differences were obtained among the treatments, after spraying. A total of 30 cm. long lac encrusted samples were collected randomly from each experimental tree at crop maturity and were caged for recording the incidence of parasitoids and predators of lac insect. Another set of similar samples were collected to quantify the yield of sticklac. No significant difference was observed with regard to lac yield. Occurrence of the associated fauna as well as bacterial and fungal pathogens were below the economic threshold level during *katki* 2000 crop.

Table 2 Field release of *Trichogramma chilonis* against lepidopterous lac prodators during katki 2000 crop raised on palas (*Butea monosperma*)

Treatment	<i>Eublemma amabilis</i>		<i>Pseudohypatopa pulverea</i>		Yield	
	Mean no. per kg broodlac	Percent reduction over control	Mean no. per kg broodlac	Percent reduction over control	Broodlac obtained/ Broodlac used	Sticklac obtained per kg broodlac
T ₁ (50 insects/tree)	22.57 (4.84)	50.93	5.14 (2.45)	57.16	3.16	0.145
T ₂ (75 insects/tree)	12.85 (3.71)	72.06	2.85 (1.90)	76.25	3.83	0.165
T ₃ (100 insects/tree)	11.14 (3.47)	75.78	2.00 (1.69)	83.33	4.24	0.168
Control	46.00 (6.85)		12.00 (3.59)		1.77	0.105
SEM	0.0763		0.1141		0.1639	
CD at 5%	0.2259		0.3380		0.4854	
CD at 1%	0.3095		0.4629		0.6650	

* Figures within parentheses are transformed $\sqrt{n+1}$ values

Table 3 Field release of *Trichogramma pretiosum* against lepidopterous lac predators during katki 2000 crop raised on bhali (*Flemingia macrophylla*)

Treatment	<i>Eublemma amabilis</i>		<i>Pseudohypatopa pulverea</i>		Yield	
	Mean no. per kg broodlac	Percent reduction over control	Mean no. per kg broodlac	Percent reduction over control	Broodlac obtained/ Broodlac used	Sticklac obtained per kg broodlac
T ₁ (10 insects/tree)	8.00 (2.98)	76.85	4.49 (2.29)	72.37	3.44	0.084
T ₂ (15 insects/tree)	6.00 (2.62)	82.64	1.42 (1.51)	91.12	3.64	0.083
T ₃ (20 insects/tree)	5.28 (2.47)	84.72	1.71 (1.61)	89.31	3.81	0.120
Control	34.57 (5.94)		16.00 (4.73)		1.98	0.075
SEM	0.1438		0.1345		0.1045	
CD at 5%	0.4261		0.3984		0.3094	
CD at 1%	0.5836		0.5457		0.4239	

* Figures within parentheses are transformed $\sqrt{n+1}$ values.

Table 4 Effect of ethofenprox on lac predator *E. amabilis*

Treatment	Post-treatment percent mortality of <i>E. amabilis</i> larvae	
	48 hrs.	96 hrs.
Ethofenprox 0.005%	68.57	58.82
Ethofenprox 0.01%	82.92	70.96
Ethofenprox 0.02%	92.72	84.62

Table 5 Effect of different pesticides on the eggs of *E. amabilis*

Treatment	Mean Percent Mortality	
Endosulfan 62.5 ppm	100.00	(90.00)
Endosulfan 31.25 ppm	93.33	(77.70)
Endosulfan 15.625 ppm	80.00	(63.93)
Endosulfan 7.813 ppm	10.00	(15.19)
Endosulfan 3.906 ppm	3.33	(6.52)
Ethofenprox 100 ppm	100.00	(90.00)
Ethofenprox 50 ppm	100.00	(90.00)
Ethofenprox 25 ppm	100.00	(90.00)
Ethofenprox 12.5 ppm	78.06	(62.17)
Ethofenprox 6.25 ppm	27.42	(31.48)
Methoprene 20 ppm	27.73	(31.62)
Methoprene 10 ppm	15.35	(22.37)
Methoprene 5 ppm	6.79	(15.00)
Control	7.85	(15.99)
C.D. at 5%	10.4940	
C.D. at 1%	14.1843	

*Figures in parentheses are angular transformed values.

Evaluation of insecticide against lac predator

Katki 2000 crop raised on potted *bhalia* plants was allowed for infestation/egg laying by the predator *Eublemma amabilis* under natural condition. The colonies were sprayed with an insecticide (ethofenprox as Nukil 10 E.C.) at one month stage of the crop and observations were taken 48 and 96 hours after treatment. The percent mortality of the larvae has been presented in Table 4. Ethofenprox, at all concentrations, tested, caused significant mortality of *E. amabilis*.

Ovicidal effect of pesticides

Eggs of *E. amabilis* were collected by caging of the adults in glass battery jars provided with paper strips for egg laying. The paper strips with freshly laid *E. amabilis* eggs were dipped for 15 seconds in various concentrations of

endosulfan, ethofenprox and methoprene. Dipping in water served as control. The treated eggs were kept under observation for hatching in glass petri dishes. Endosulfan (62.5 ppm), ethofenprox (100, 50, 25 ppm) caused cent percent mortality while it was least at all doses of methoprene and lower doses of endosulfan. Ethofenprox at 25 ppm was found to be most suitable for control of *E. amabilis* at egg stage (Table 5).

Evaluation of safety of insecticides towards beneficial parasitoid

Three insecticides viz., endosulfan (Thiodan), dichlorvos (Nuvan) and ethofenprox (Nukil) were evaluated for their safety towards the beneficial parasitoid, *Bracon hebetor*, under laboratory conditions. Dichlorvos (0.03%) and ethofenprox (0.01%) did not show any adverse effect on the parasitoid tested. Endosulfan (0.05%), however, proved to be highly detrimental as it caused cent percent mortality within 24 hrs. of treatment.

Biological control of lac predators by parasitoids under field condition

With an objective to assess fluctuation in the lac associated faunal structure, samples were drawn weekly from different lac crops. *Tachardiaephagus tachardiae* and *Tetrastichus (Aprostocetus) purpureus* were found to outnumber all the associated inimical parasitoids. Unlike previous year, this year also *Elasmus claripennis* outnumbered all the beneficial parasitoids during katki 2000 crop.

Management of important lac hosts under agro - forestry system for kusmi lac production

With a view to integrate lac cultivation with general agriculture for sustainable lac and higher biomass production per unit area and time and also to meet the diversified need of the farmers, a lac based cropping model for upland (*Tanr I*) was laid out. It consisted of four lac host plants of different canopy spread and height viz., *Zizyphus mauritiana*, *Albizia lucida*, *Flemingia macrophylla* and *Flemingia semialata* raised along the boundary of the field while the main plots were utilized for raising vegetables.

Aghani 1999-2000 lac crop (*kusmi* late emerging), raised on two *Flemingia* spp. and *galwang* (*Albizzia lucida*), were harvested towards the end of February and early March 2000. Performance of lac crop was found to be satisfactory on *F. semialata* with an average yield of 100g/bush of scraped lac. The ratio of broodlac obtained to broodlac used and total scraped lac yield to scraped lac of broodlac used were 2.75 and 2.55, respectively. Summer (*jethwi* 2000) lac crop, raised on these hosts including self-colonization in *galwang*, failed to produce any significant yield.

Plant growth attributes, recorded prior to lac inoculation (*aghani* 2000-01) for both *Flemingia* spp. and *galwang* have been presented in Table 6. Almost all the plant growth characters showed better performance in case of *F. macrophylla* than those of *F. semialata*, confirming the previous results. The rate of increment in plant height was 0.51 and 2.20 cm/day in *F. macrophylla* and 0.24 and 1.20 cm/day in *F. semialata* during 80 DAC (days after coppicing/harvesting) and 80-150 DAC respectively. Similarly, the rate of increment in plant girth measured at 5 cm above the ground level was 0.026 and 0.020 cm/day during 80 DAC and 0.015 and 0.013 cm/day during 80-150 DAC in *F. macrophylla* and *F. semialata*, respectively. Accordingly, number of tillers counted at 80 and 150 DAC of both the *Flemingia* spp. indicated that the number of tillers/bush reduced later. Winter lac crop (*aghani* 2000-01) raised on *Flemingia* spp. and *galwang* are progressing well. Three vegetable crops viz., Okra (*Abelmoschus esculentus*), French bean (*Phaseolus vulgaris*) and bitter gourd (*Momordica charantia*) were raised in the main plot. The overall performance of French bean was found to be satisfactory with an average yield of 57.5 q/ha.

Management of *akashmani* (*Acacia auriculaeformis*) for lac cultivation

The winter lac crop (*aghani* 1999-2000) raised on *akashmani* was harvested towards the end of February. Out of total shoot length of

primary and secondary twigs available, only 26% of shoot length was preferred by lac larvae for their settlement. Out of which only 31.6% of shoot length was covered with significant lac encrustation. The suitable girth of twigs for thick lac encrustation was found to be 2.37-3.38 cm. in winter lac crop.

A prediction model for broodlac, sticklac and biomass yield for winter lac crop, was also developed through correlation and regression analysis. Plants were inoculated with *kusmi* strain at a uniform rate of 20g per meter inoculable shoot length during second fortnight of July 1999. Measurement of five easily accessible independent variables, viz., plant height, basal girth, girth at breast height, mean canopy spread, number of secondary branches and broodlac used were recorded at the time of inoculation, whereas coverage of shoot length with lac insect was recorded at the time of harvesting of the crop. Data on dependent variables viz., broodlac (y_1), sticklac (y_2) and total harvested biomass (y_3) were recorded at crop harvesting. Multiple regression (MR) analysis with step down related variables from the correlation matrix has been applied.

The highest correlation coefficient was obtained in case of dependent variables such as broodlac and sticklac yield with plant height were 0.5376 and 0.5630 respectively while biomass yield with basal girth was 0.9002 (Table 7a).

Two multiple regression (MR) equations obtained for each of the three dependent variables (y_1 , y_2 , & y_3) have been presented in Table 7b. In case of broodlac yield, the regression equation, using seven independent variables (x_1 - x_7), has yielded a significant value of coefficient of determination of 0.6174 explaining 61.7% variation in broodlac yield. Similarly, for sticklac yield (y_2), the two equations obtained from x_1 - x_7 and x_1 - x_6 (independent variables) have shown highly significant coefficient of determination of 0.7542 and 0.6461 respectively while in case of biomass yield (y_3), these were of 0.9273 and 0.9001.

Table 6 Plant growth attributes of *Flemingia* spp. and *Albizzia lucida* prior to lac inoculation (winter lac crop 2000-01)

Host	Plant height (cm)			Basal girth* (cm)			No. of tiller/primary branches per bush			Canopy spread (m)		Total shoot length(m)	Inoculable shoot length(m)
	80 DAC	150 DAC	240 DAC	80 DAC	150 DAC	240 DAC	80 DAC	150 DAC	240 DAC	N-S	E-W		
<i>Flemingia macrophylla</i>	41.1	195.0	-	-	3.11	-	24.4	29.2	-	-	-	28.1	15.8
<i>Flemingia semialata</i>	19.2	203.0	-	-	1.57	-	11.4	10.2	-	-	-	10.2	4.7
<i>Albizzia lucida</i>	-	-	330.0	-	-	23.91	-	-	5.4	2.86	2.48	20.5	9.4

DAC - Days after coppicing/harvesting

* Primary branch

Table 7a Correlation matrix of different variables of *akashmani*

Characters	Mean	Correlation Coefficient (r)									
		X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	Y ₁	Y ₂	Y ₃
X ₁ Plant height (m)	5.485	1.0000	0.5006*	0.4637*	0.4484*	0.3291	0.1509	0.1037	0.5374***	0.5630**	0.4087
X ₂ Basal girth (cm)	31.900		1.0000	0.4010	0.4910*	0.5395**	0.5164*	0.3008	0.3272	0.3414	0.9002***
X ₃ Girth at breast height (cm)	18.500			1.0000	0.2748	0.3268	0.0454*	0.4076	0.2188	0.2399	0.6461**
X ₄ Mean canopy spread (m)	2.879				1.0000	0.2140	0.7117**	0.2483	0.4261	0.5109*	0.3535
X ₅ Secondary branches (nos.)	15.225					1.0000	0.2915	0.7579**	0.5000*	0.5450**	0.5071*
X ₆ Broodlac used (g)	332.800						1.0000	0.1537	0.4172	0.4775*	0.3170
X ₇ Lac insect coverage (m)	7.115							1.0000	0.4568*	0.5281*	0.2864
Y ₁ Broodlac yield (kg)	0.552								1.0000		
Y ₂ Sticklac yield (g)	236.785									1.0000	
Y ₃ Biomass yield (kg)	12.815										1.0000

Table 7b Values of regression equations for estimating broodlac, sticklac and biomass yield of *A. auriculaeformis*

Dependent Variable	Independent variable	Intercept constant	Regression coefficient							Coefficient of determination	F
			b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇		
Broodlac yield (Y ₁)	X ₁ - X ₇	-0.7221	0.2309	-0.0106	-0.0085	-0.1389	-0.0060	0.0012	0.0819	0.6174	2.7663*
	X ₁ - X ₆	-0.4528	0.1632	-0.0154	0.0002	-0.0095	0.0214	0.0009		0.5320	2.4633*
Sticklac yield (Y ₂)	X ₁ - X ₇	-337.8472	96.8933	-5.4207	-3.6239	-42.651	-2.596	0.5347	37.6105	0.7542	5.2603**
	X ₁ - X ₆	-214.2464	65.7819	-7.6131	0.3507	16.7023	10.0210	0.3775		0.6461	3.9553*
Biomass (Y ₃)	X ₁ - X ₇	-19.0240	-2.8253	1.1432	-0.6294	2.4164	0.5315	-0.0164	-1.4578	0.9273	21.8675**
	X ₁ - X ₆	-23.8146	-1.6146	1.222	0.4753	0.1158	0.0424	-0.0103		0.9001	19.5277**

Nutrient management in soil for maximizing lac yield

Effect of nitrogen on plant growth and lac yield of palas

An experiment was laid out in RBD with ten treatments and four replications to see the effect of nitrogen on plant growth and lac yield of early pruned ten-year-old *palas* trees on granitic gneiss origin acid soil, low in nitrogen, phosphorus and potassium at ILRI Farm Namkum.

Application of fertilizer under different treatments (g/tree/season) was as follows :

T ₁	- Control
T ₂	- N 20 1/2 urea + 1/2 FYM
T ₃	- N 40 1/2 urea + 1/2 FYM
T ₄	- N 60 1/2 urea + 1/2 FYM
T ₅	- N 80 1/2 urea + 1/2 FYM
T ₆	- N 20 Inorganic
T ₇	- N 40 Inorganic
T ₈	- N 60 Inorganic
T ₉	- N 80 Inorganic
T ₁₀	- N 100 1/2 Inorganic + 1/2 organic

Basal dose of 50 g P₂O₃ + 30 g K₂O/tree in all trees.

Rangeeni broodlac was inoculated at two brood rates, i.e., 10 and 20 g per metre shoot length under a two coupe system during third week of October. Initially, settlement of lac insects was observed to be very good but subsequently high degree of mortality of lac insects was observed.

High percentage of female insect production was found under treatment T4 (79.3%), T3 (78.8%), T10 (76.5%) and T5 (75.0%). The experiment is in progress.

IMPROVEMENT IN PRODUCTIVITY AND QUALITY OF LAC THROUGH DIFFERENT BREEDING APPROACHES FOR INSECT AND THEIR HOST PLANTS

Collection, maintenance and evaluation of lac insect germplasm

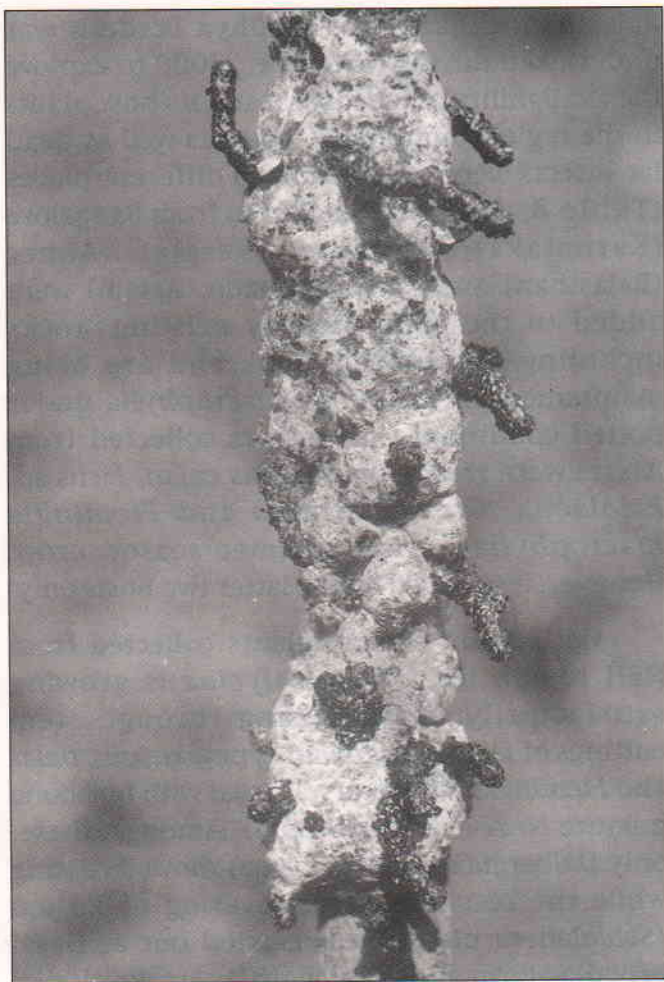
An exhaustive survey of selected areas in

Rajasthan, Gujarat and Madhya Pradesh was undertaken during November, 2000 to explore the availability of lac insects and its host plants in the region. Samples of living as well as dead lac insects were collected from different places (Table 8). Lac insects collected from Bangalore (Karnataka), Thrissur (Kerala), Ajmer (Rajasthan) and Amsoi (Nagaon, Assam) were added to the eight already existing stocks including one inbred stock and are being maintained on *Flemingia macrophylla* under potted conditions. Lac insects collected from Assam were reared on *Cajanus cajan*, *Ficus* sp. *Eriolaena*, *Grewia hirsuta* and *Flemingia macrophylla* during summer season crop. However, it survived on the latter two hosts only.

Germplasm of host plants collected from NEH region like *Kydia calycina* is growing satisfactorily. Plant raising through stem cuttings of *Dalbergia* (dwarf type), *kusum*, *palas* and *Flemingia semialata* was tried with hormone mixture NAA + IBA (100 ppm). Amongst these, only *Dalbergia spp.* (dwarf type) showed rooting while the rest failed. Air layering of *kusum* (*Schleiehera oleosa*) was carried out at Hesal broodlac farm and 60% of air-layers developed roots.

Pest spectrum of collected lac insect germplasm

Living as well as dead lac insect samples were collected from different places in Karnataka and Kerala during October-November, 1999 for study of associated pests. About 50 cm long lac-sticks of collected samples were caged in wooden boxes having provision of ventilation. Insect pests emerging from the individual cages in the attached glass tubes were collected daily. Various pests found associated with lac insects of different places, are shown in Table 9. No pest was found associated with living lac colonies collected from Bangalore and Palakkad. Interestingly, at both these places, ants were found visiting lac insect cultures for collection of honeydew excreted by the insects. Similarly, no pest emerged from the samples of *Paratachardina sylvestrii* collected from *Santalum album*, *Pongamia pinnata* and *Casurina equisetifolia* near Bangalore. However, living lac insects collected from Amsoi (Assam),



Predator galleries on lac encrustation

Chitradurga (Karnataka) and dead lac insect collected from Palakkad (Kerala) were heavily infested with predators and parasites. *Eublemma amabilis* was the most abundant pest associated with all the three samples. Population of parasitoids of lac insect was negligible at places where lac insect had established recently. However, spectrum of pests associated with lac insect of Assam, where lac is well established, was found to be more intricate. The qualitative and quantitative variation in the pest profile of the lac insects collected from different places may be attributed to differing climatic conditions and associated biotic conditions.

Lac insect breeding studies

Trivoltine crimson lac insect was crossbred with bivoltine yellow *kusmi* stock of Orissa (vide Annual Report, 1996-97, p.20). Reciprocal crosses have been maintained on potted plants of *Flemingia macrophylla*. Subsequent progenies expressing yellow colour and trivoltine

characteristics were observed in F_9 generation. These insects were put under selection to stabilize the desired trait. The selected yellow progeny is behaving like trivoltine lac insect since the last three generations. However, it may be emphasized that the trivoltine crimson lac insect has been showing shifting life cycles for the last eleven generations since its introduction under Ranchi climate. Selection needs to be under further observation at least for one year.

Lac insect-host plant interaction

The resin obtained from *kusmi* crimson lac insect cultured for one generation on four hosts viz., *Acacia auriculaeformis*, *Albizzia lucida*, *Flemingia macrophylla* and *Schleichera oleosa*, was analysed for colour, life and flow to find out any variation due to host-plant (Table 10). Preliminary analysis has revealed minor differences in the above parameters studied. Statistically laid out experiment will be taken up next year.

Evaluation of *Flemingia* sp. as *kusmi* lac host

Seven biotypes of *Flemingia* spp. namely *F. macrophylla* (Acc No.- ICPW 194, 196, 198) *F. semialata* (ICPW-201), *F. stricta* (ICPW-202), and *F. strobilifera* (ICPW-204) collected from ICRI, Hyderabad during 1994-95 were grown in RBD with 4 replications. These plants were pruned in January-February and July-August for taking *kusmi* lac crops. These biotypes were tested for their performance of *kusmi* lac production by inoculating with *kusmi* brood lac collected from Hesal brood farm during last week of July, 2000 for raising *aghani* lac crop. Data on plant and insect attributes, namely, larval coverage, mortality, cell wt., brood lac/m, scraped lac/m, lac yield, and biomass produced/bush were collected. Differences with regard to plant attributes, such as no. of shoots/bush, no. of inoculable shoots, average length of shoots, length of lac coverage/shoot and diameter of shoots were found significant whereas lac insect attributes viz., density of settlement and larval mortality were found non-significant. These plant attributes showed heritability in broader sense varying between 57 to 91%. The maximum value 91% was obtained in case of number of shoots per bush

Table 8 Collection of lac insects from different places

Date	Place (State)	Host-plant	Remarks
24.11.2000	Jodhpur (Rajasthan)	<i>Ziziphus mauritiana</i> (Tikari variety)	Yellow and crimson lac insects
24.11.2000	Nimaz Pali (Rajasthan)	<i>Ziziphus mauritiana</i>	Dead insect
25.11.2000	Pushkar Ajmer (Rajasthan)	<i>Ficus religiosa</i>	Yellow lac insect
26.11.2000	Ajmer (Rajasthan)	<i>Ficus carica</i>	Yellow and crimson lac insects
26.11.2000	Dahod - Jhabua Rd. (Madhya Pradesh)	<i>Ficus religiosa</i>	Freshly settled larvae
27.11.2000	Vadodara (Gujarat)	<i>Ficus religiosa</i>	Freshly settled larvae
28.11.2000	Vadodara (Gujarat)	<i>Ficus nuda</i>	Freshly settled larvae
28.11.2000	Vadodara (Gujarat)	<i>Putranjiva roxburghii</i>	Freshly settled larvae
28.11.2000	Vadodara (Gujarat)	<i>Putranjiva roxburghii</i>	Freshly settled larvae
29.11.2000	Vadodara (Gujarat)	<i>Putranjiva roxburghii</i>	Dead lac insect

Table 9 Pest spectrum of the collected lac insect germplasm

Pest	<i>Kerria sp.</i>					Total
	<i>Ficus sp.</i> (Amsoi, Assam)	<i>Ficus sp.</i> (Bangalore, Karnataka)	<i>Acacia</i> <i>auriculae-</i> <i>formis</i> (Chitradurga, Karnataka)	<i>Amhertsia</i> <i>nobilis</i> (Thrissur, Kerala)	<i>Albizzia sp.</i>	
<i>Eublemma</i> <i>amabilis</i>	65	-	379	13	47	504
<i>Pseudohypatopa</i> <i>pulverea</i>	12	-	2	-	-	14
<i>Aprostocetus</i> <i>purpureus</i>	35	-	4	1	-	40
<i>Tachardiaephagus</i> <i>tachardiae</i>	4	-	-	2	-	6
<i>Pristomerus</i> <i>sulci</i>	3	-	-	-	-	3
Total	119	-	385	10	47	567

Table 10 Different parameters of resin as affected by the host-plant

Host plant	Crop							
	<i>Aghani</i>				<i>Jethwi</i>			
	Colour index	Life (min.)	Flow (mm)	% Crop survival at maturity	Colour index	Life (min.)	Flow (mm)	% Crop survival at maturity
<i>Acacia auriculaeformis</i>	8.00	66.5	82.0	33.3	8.00	62.0	65.0	13.3
<i>Albizzia lucida</i>	8.67	68.5	85.8	66.7	9.00	60.0	66.0	53.3
<i>Flemingia macrophylla</i>	10.5	64.5	78.0	70.0	10.0	60.0	61.0	60.0
<i>Schleichera oleosa</i>	9.0	67.0	83.0	80.0	8.0	55.0	70.0	86.7

with 16.8% genetic advance. Amongst the plant attributes, the number of shoots/bush has shown highest heritability (91%) followed by diameter of shoots (73%). The length of coverage amongst preferential parameters, had shown high heritability (58%). Out of five yield parameters, cell weight, brood, scraped lac/m along with brood and lac stick/bush tested, the scraped lac yield has shown highest value of heritability (79%) followed by broodlac/m (69%) and brood lac per bush (64%) (Table 11).

Mechanization of lac cultivation operations

Design and development of pedal-operated roller-type lac scraper

During the period under report, a pedal-operated roller-type lac scraper was designed and

developed. The machine consists of two corrugated mild steel rollers, each of 200 mm length and 125 mm diameter. One of the rollers is fixed and the other one is spring loaded and thus adjustable. The rollers rotate in opposite directions at a speed differential of 1:1.6 between them. In idle condition, the gap between the fixed and adjustable roller is 2mm. During operation, the gap is adjusted automatically according to the diameter of lac sticks and allows the entry of lac sticks between the rollers. In this way, the sticks are caught in between the rollers and lac is scraped under compression and shear forces.

A sieve of 10 mesh size is fitted at an inclination of 45°, with respect to the horizontal, under the two scraping rollers to receive the scraped lac and stick. Most of the lac encrustations of less than 10 mesh size pass

Table 11 Data showing plant, lac insect and lac yield parameters of different *Flemingia* spp. for aghani lac crop during 2000-01

Treatment	Plant				Attributes of lac insect			Lac yield/bush					
	DIS (cm)	NIS bush	NS bush	LIS (cm)	L cover (cm)	Density /cm	Initial mortality	Lac stick/m (g)	Brood/ m(g)	Scraped/ m (g)	Brood (g)	Biomass (kg)	Cell wt (mg)
<i>Flemingia</i> (T3) <i>macrophylla</i> (ICPW 194)	2.85	14.60	18.60	149.5	90.9	203.5	31.6	480.5	60.0	19.5	302.0	2.03	3.69
<i>Flemingia</i> (T4) <i>macrophylla</i> (ICPW 196)	3.10	6.05	13.08	153.2	75.8	197.3	42.6	714.2	68.2	25.5	135.5	1.23	3.94
<i>Flemingia</i> (T5) <i>macrophylla</i> (ICPW 198)	2.85	8.80	18.52	151.6	75.6	241.5	35.6	499.5	82.2	22.5	269.0	1.30	3.33
<i>F.paniculata</i> (T6) (ICPW 200)	2.65	8.25	11.95	140.4	83.2	242.0	38.7	374.7	72.0	30.0	212.5	0.98	2.70
<i>F.semialata</i> (T7) (ICPW 201)	3.17	6.20	14.05	157.4	79.3	242.2	31.7	921.7	179.5	112.7	661.2	2.67	3.56
<i>F.stricta</i> (T8) (ICPW 202)	2.85	9.12	69.25	192.2	47.9	228.2	37.2	387.0	77.5	24.5	72.5	1.75	4.94
<i>F.strobilifera</i> (T10) (ICPW 204)	2.42	18.48	34.45	101.6	56.3	180.5	26.3	1083.0	68.7	29.5	194.0	2.05	4.01
CD	0.72	33.78	8.80	36.96	26.54	75.79	19.1	701.25	36.52	22.72	186.87	0.73	1.35
h ² %	73.00	67.00	91.00	57.00	58.00	-4.00	-11.0	5.00	69.00	79.00	64.00	54.00	20.00
G.A.	9.49	18.27	16.80	6.3	8.05	-0.37	-1.34	0.88	10.49	16.03	12.13	7.59	2.22

N - Number, I - Inoculable, S - Shoot, D - Diameter, L - Length

through the sieve and fall on inclined pan, which guides the received material towards the outlet of the machine. The scraped lac, which does not pass through the sieve along with the sticks, slides down the sieve and comes out of the machine.

A feed hopper is situated at the top of the machine which safely guides the lac sticks between the scraping rollers. The drive mechanism comprises of a pedalling system, V-groove pulleys and V-belt to transmit power from pedal shaft to the fixed and spring loaded rollers. A seat is also provided for operator. The basic structure of the machine, i.e., frame on which various components are fixed is made of mild steel angle iron (50x50x50 and 25x25x25 mm). The feed hopper frame is made up of mild steel flat (25x5 mm).

The machine scrapes about 6 kg lac sticks in an hour and separates about 95 percent of lac encrustations from lac stick in two passes.

Extension Research

Survey of Lac Growing Areas

A limited scale survey of some lac growing areas was carried out in Jharkhand, West Bengal and Orissa. Socio-economic data were collected from 244, 280 and 77 households of these states respectively. The pooled data indicate that 96% of the households own one or more species of the conventional lac host trees namely, *kusum*, *ber* and *palas*. It was also revealed that maximum number of households (81%) possess *ber* trees followed by *palas* (71%) and *kusum* (51%). In terms of host utilisation for lac cultivation, maximum number of households (84%) utilise *ber* trees followed by *palas* (72%) and *kusum* (57%). This pattern was more or less similar in West Bengal and Jharkhand, whereas in Orissa, *kusum* was the only lac host available in the surveyed areas and 92% of the households were involved in lac cultivation. The data collected also provide information on per cent of households having more than one kind of lac hosts and their utilisation alone or in combination with other hosts for lac cultivation.

Survey data, in respect of available number of *kusum* trees from 33 villages of three blocks of district Nabrangpur, Orissa have been collected from various Block Development Officers on behalf of the Collector of Nabrangpur, while exploring the possibility of opening of a broodlac farm on request from the Collector. The information is given in Table 12.

Table 12 Survey Report of Nabrangpur district for lac host trees and status of lac

Sl. No	Place, Block	Village	Approx. no. of trees	Status of lac		
1.	Jharigram	Chilki		—		
		Mundimar		—		
		Ichapur		—		
		Karlamari		—		
		Chachamar		—		
		Barhakarmani		—		
2.	Raighar	Barhaguda	200	—		
		Futanoda	300	++		
		Haladihi	500	—		
		Anchala	300	—		
		Mundibeda	150	+		
		Patrinal	100	+		
		Ganjapara	Kusumpur	800	+	
		Timanpur	Binaypur	400	—	
		3.	Chandahandi	Rajkot	467	++
				Bandhakona	146	—
Baidpada	246			++		
Pathkkhalya	405			—		
Chilinga	150			—		
Bharjdi	120			—		
Delabeda	Dalabeda			190	—	
	Banamahal			100	+	
	Kacharpada			50	+	
	Antipada			60	+	
	Bhattipada			180	+	
Fataki	Fataki			650	—	
	Balazhar			56	—	
Koelimunda	Telimar			280	—	
	Koelimunda	160	—			
	Jhulenbar	150	—			
Jamandoda	Longbada	120	—			
	Karadangri	50	—			

- Not Known, + limited lac hosts, ++Good lac

Adhoc Research Schemes

Lac productivity rating of different lac insects and promising lac hosts

The project has been concluded in April 2001. The summary report on the project has been furnished below.

Altogether 28 of lac insects, collected from Jharkhand, West Bengal, Orissa, Chattisgarh, NEH and Karnataka were maintained at ILRI Farm after accessioning on the respective hosts and studied for 1) morphological and biological characterization, 2) identification of lac productivity linked parameters, genetic variation and character correlation, 3) lac productivity on conventional hosts, *palas*, *ber* and *kusum* along with development of productivity models on them, 4) lac productivity of various stocks at Ranchi (Jharkhand) and Chakidih (Orissa) and 5) identification of productive breeds of lac insects. Major findings are given below :

- All the 28 collected lac insect stocks could be grouped into 6 species, viz., *Kerria ebranchiata*, *K. chamberlini*, *K. lacca*, *K. nagoliensis*, *K. chinensis* and *K. sharda*. *Kerria sharda* Mishra & Sushil has been proposed as new tri-voltine species.
- On the basis of biological and breeding evidences four species could be synonymised with *K. lacca*. The controversy of considering *kusmi* and *rangeeni* strains under *K. lacca* has been resolved by designating *kusmi* as *K. nagoliensis* and *rangeeni* as *K. lacca* separately.
- Density of settlement, initial mortality, sex-ratio, survival at crop maturity, live and dry cell weight, lac resin per female and life period have been identified as important lac insect characters linked with lac productivity.
- The importance of productivity linked characters was found to vary from species to species of lac insects and hosts plants.
- Linear multiple regression models have been developed for assessing lac productivity on conventional hosts, *palas*, *ber* and *kusum*.
- Most of the promising lac hosts viz., *bhalia* (*Flemingia macrophylla*), *galwang* (*Albizia lucida*), rain tree (*Albizia saman*) and *akashmani* (*Acacia auriculaeformis*) have shown high intra-specific variability in their susceptibility to lac insects.
- *K. nagoliensis* was found to be most impor-

tant productive breed on *kusum* and *ber* at Ranchi and Chakidih as well as on *F. macrophylla* at Ranchi.

- *K. lacca* proved to be the only suitable species for *palas*.
- *K. chinensis* was found to be highly productive on *Kydia* which was almost at par with that of *K. nagoliensis* on *kusum*.
- *K. sharda*, the tri-voltine lac insect species was found suitable only for its native locality, the Eastern Ghats of Orissa.
- Four lac insect stocks viz., LR-5312, LR-5313, LR-5314 and LR-5316 of *K. nagoliensis* were selected for their high productivity on conventional hosts. The former two were most suitable for *kusum* and the later two on *ber* at Ranchi and Orissa.
- Two productive breeds of *K. lacca* (LR-5712 and LR-5101) were found most promising on *palas*.

From the evidences presented herein, it can safely be concluded that several species proposed from Indian sub-continent do not actually occupy the status of separate species but stand at lower taxonomic status under species of regional importance. Amongst the productivity linked parameters of lac insects, density of settlement, resin output per female, survival at sexual maturity and life period are very important for improvement of lac insects through conventional breeding approaches. Intra-specific variation in lac insect susceptibility of lac host species have greater impact on various productivity linked attributes which may be considered for evolving good host plant variety for increased productivity. Hence, various lines of work emerged from the present study for further increasing the productivity of lac insects are worth considering for planning research and development activities in lac production.

Pilot Study on forecasting of broodlac from *Butea monosperma* (*palas*)

The first lac crop (*baisakhi-cum-katki* 1999-2000) was raised on 110 trees of *palas*, simultaneously at all the three places namely,

Bilaspur, Purulia and Ranchi. The data on possible yield explanatory characters were taken into account which have been quantified at various stages of crop growth. The biometrical characters were host canopy height and diameter, broodlac input per tree, settlement density of lac insect on shoots, living female density, percentage of male insects, incidence of parasites and predators, length of settlement per shoot, number of petioles with lac insect settlement per shoot and number of shoots with lac insect settlement per tree. The yield of broodlac per tree has been taken as dependent variable. Based on correlation study, the yield explaining characters have been identified from the first year crop data. For Bilaspur, host canopy height, diameter and quantity of broodlac input showed significant linear relation with yield of broodlac. Although these characters can be quantified at a very early stage but these explained only 18% variation in yield. The length of settlement of lac insect, per shoot and number of shoots with lac insect population per tree are other significant characters. These two together explained 68% variation in yield. These two characters can be quantified 10 weeks prior to crop maturity. At Purulia also, similar result was obtained but these characters explained 26% variation in yield. However broodlac input alone explained 21% variation in yield. This figure is higher than that for Bilaspur (16%). The number of shoots with lac insect population, length of settlement of lac insect per shoot (41-42 week stage), incidence of parasites and predators (37-38 week stage) and density of living lac insects (48-49 week) stage are other yield attributing characters. These together explained 95% variation in yield of broodlac. The pooled data of first year crop also showed that broodlac yield is a function of quantity of broodlac used for raising the crop, host canopy height and its diameter, but these characters together explained only 21% variation in yield. However, the quantity of broodlac used per tree alone explained only 16% variation. The number of shoots per tree with lac insect settlement and length of settlement and length of settlement per shoot (41-42 week stage), incidence of predators (44-45 week stage)

and living insect density (48-49 week stage), were also found important yield explaining biometrical characters.

The number of shoots with lac insect settlement was most important yield explaining biometrical character as without this, 3 other characters explained only 20% variation, whereas inclusion of this, explained 90% variation in yield of broodlac. The tentative model, with 3 characters namely, number of shoots with lac insect settlement (SN), number of predators per 30 cm lacsticks (after 44-45 weeks, PN) and living female density per 10 sq. cm. (after 48-49 weeks) LFD, can be represented from the regression equation as

$$Y = -1.198 + 0.0733 (\pm 0.002)** SN + 0.089 (\pm 0.039)* PN + 0.017 (\pm 0.008)* LFD$$

The second year crop was raised during October 2000 on pruned (during April 2000) trees at all the selected sites (Bilaspur, Purulia and Ranchi). The biometrical characters like broodlac input per tree, tree canopy height and diameter, settlement density of lac insect, living insect density and percentage of male insects have been quantified.

R.F.R.S., Balarampur, West Bengal

The results of some experiments carried out at the station have been furnished below :

Effect of site of inoculation on lac yield on Flemingia semialata

An experiment was laid out in Randomised Block Design with seven replications in the *aghani* season. Three portions of the shoot, i.e., upper, middle and lower were taken into consideration on one-year-old single stalked plants.

Average brood and scraped lac yield per plant (Table 13) were found to be maximum for plants inoculated in the middle. Plants inoculated at bottom did not yield lac at all. It was also noticed that 100% of plants inoculated in the lower portion did not produce any lac, while it was so only in 14.3% of the plants inoculated in the middle portion.

Table 13 Effect of site of inoculation on lac yield for *F. semialata*

Site of Inoculation	Brood yield per plant (g)	Scraped lac yield per plant (g)	Non bearing plants (%)
Upper	33.8	12.1	57.2
Middle	63.5	33.7	14.3
Lower	0	0	100

Effect of irrigation on brood yield and quality of brood lac on *F. semialata*

Varying number of one year old plants were subjected to five levels of irrigation (daily, three days, two days, one day in a week and control) on different rows of the plant in *aghani* season. Thus, the experiment followed completely randomised design. Brood and scraped lac yield per plant (Table 14) was not influenced significantly by irrigation levels. However, percentage of viable cells and shoot length covered by 10g of brood were significantly influenced by irrigation levels. With the increase in irrigation level the sustainability of lac insect was improved and as a result there was a proportionate increase in number of living cells at the time of harvest and more number of lac larvae per unit brood weight could settle on relatively larger areas. Thus, irrigation improved brood quality test for significance.

Different levels of inoculation influencing lac yield

Plant and lac insect mortality due to over-inoculation in *F. semialata* have been observed in the past. The present experiment aimed at optimizing coverage for lac cultivation. Different proportion of shoot length (10, 20, 40 and 80 %) was inoculated with *kusmi* strain of lac insect for *aghani* crop, in seven replications in

Randomised Block Design. One-year-old plants were taken for experiment. Crop protection measures were adopted as and when required. Equal number of observations was not available for each treatment due to crop mortality. So calculation was done in completely Randomised design.

Brood and scraped lac yield, varied significantly at different levels of coverage (Table 15). Brood lac yield per plant was maximum at 40% coverage, while stick lac (scraped lac) yield was found to increase upto a highest level of coverage.

Table 15 Brood and scraped lac yield as affected by rates of inoculation in *F. semialata*

Coverage of available shoot length	Brood lac yield per plant (g)	Scraped lac yield per plant (g)
10%	87.5	21.2
20%	210.2	68.7
40%	310.0	85.0
80%	318.7	126.2
SEM ±	69.8	20.2
CD (.05)	128.0	37.1

R.F.R.S., Dharmjaigarh, Chhattisgarh

One Sr. Scientist has joined the RFRS on 21st August 2001. Work on the status of lac cultivation in the newly formed Chhattisgarh State, collection of data on the area having host trees and status of their exploitation for lac cultivation are in progress. Correspondence pertaining to shifting the station from Dharmjaigarh to Bilaspur with the Govt. of Chhattisgarh is underway and 5 ha. land is likely to be allocated at Sakari, Bilaspur.

Table 14 Brood quality and lac yield as affected by different levels of irrigation on *F. semialata*

Irrigation schedule	Brood lac yield per plant (g)	Scraped lac yield per plant (g)	Viable cells (%)	Shoot length covered by 10g. brood (ft.)
Daily	282.5	122.5	65.5	3.06
Thrice a week	136.4	71.5	49.8	2.07
Twice a week	183.1	74.8	47.3	1.43
Once a week	273.7	91.2	42.4	0.88
No irrigation	160.6	68.0	23.1	1.18

DIVISION OF LAC PROCESSING AND PRODUCT DEVELOPMENT

DEVELOPMENT OF VALUE-ADDED PRODUCTS (SEX PHEROMONES, PGR, POLYBLEND) AND SURFACE COATING MATERIALS FROM LAC RESIN

Syntheses of some bioactive compounds from aleuritic acid

Pheromones are specific chemicals released by insects for communication. These form component of integrated pest management due to their eco-friendly and chemically safe nature. During the period under report, a pheromone component was synthesised from aleuritic acid for evaluation against *Helicoverpa armigera* (cotton bollworm moth), adopting the reaction sequences reported last year.

(Z)-9-Hexadecen-1-al

threo - Aleuritic acid was converted into *erythro* isomer and then to unsaturated acid by reacting it with triethylorthoformate/benzoic acid followed by alkaline hydrolysis. Its methyl ester was mesylated and reduced with LAH/THF to afford *(Z)-9-hexadecen-1-al*. It was then treated with pyridinium chlorochromate in dichloromethane to obtain *(Z)-9-hexadecen-1-al* which was further purified by column chromatography.

The compound thus obtained was tested by Bio-control Research Laboratories, a Division of Pest Control (India) Ltd. at Bangalore by blending *(Z)-9-hexadecen-1-al* prepared by the institute with *(Z)-11-hexadecen-1-al* available with them. Sex-pheromone lures of *Helicoverpa armigera* was prepared and put out in a sunflower field at Bangalore. It caught 23 adult males of *Helicoverpa armigera* within a span of 3 days.

Insect repellent compound

1,9-Nonane diol diacetate was synthesised from aleuritic acid in two steps. Aleuritic acid

on periodate oxidation yielded azelaic acid aldehyde as one of the products which was reduced with LAH/THF to afford 1,9-nonane diol which, on acetylation with $\text{Ac}_2\text{O}/\text{Py}$ gave the title compound as thick liquid. The compound is reported to show mosquito repellent activity in literature. Its evaluation is in progress.

1,7-Heptane diol diacetate

Aleuritic acid on periodate oxidation yielded 7-hydroxy heptanal, which was reduced with LAH/THF to submit 1,7-heptane diol. Its diacetate was prepared by acetylation with $\text{Ac}_2\text{O}/\text{Py}$ at room temperature for 24 h. and usual work up (yield 40%). Mosquito repellent activity of this compound is being evaluated.

(E)-2-undecene 1, 11-diol diacetate

(E)-2-undecene 1,11-diol diacetate was synthesised from aleuritic acid by adopting simple reaction sequences. The compound may exhibit mosquito repellent activity.

Erythro-Aleuritic acid from threo-aleuritic acid

Process for the synthesis of *erythro*-aleuritic acid from *threo*-aleuritic acid was improved by using $\text{HBr}/\text{Acetic acid}$ followed by alkaline hydrolysis in quantitative yield.

Development for lac-based wood varnish, metal lacquers for wood packaging and hot melt adhesives

Wood Varnish : The properties of alcohol-based *Melfolac* and spiritless varnish developed were reported last year. In order to increase the heat and water resistance of spiritless shellac varnish (Table 16), different synthetic resins e.g., MF 310, MF 268, M 70, BG 40, MI 70, MB 98, 18 LV and B 20 MB were separately added in different proportions (10 to 50%) in the (DL) shellac varnishes. The results were not encouraging as compared to spiritless varnishes.

Table 16 Characteristics of spiritless varnish compositions based on shellac-synthetic resin

Characteristics	Shellac-synthetic resin varnish in spiritless solvent
Appearance	Clear solution
Drying time	
1. Touch Dry	10 min.
2. Hard Dry	1 h.
Water Resistance	Passes
Heat Resistance at 99°C	Failed
Gloss (% of standard black glass) (application by brush)	47

Hot-melt Adhesive : Hot-melt adhesive compositions based on lac was prepared in 2 kg lot for book binding, binding paper and packaging, footwear, ceramics, metals and for preparation of wooden boxes etc. The adhesive joints these surfaces within 10 minutes. Lac



Cartons, ceramic jointed by Hot-Melt Adhesive

based hot-melt adhesive appears to hold promise in packaging industries.

Metal lacquer for food packaging: In continuation with the work reported earlier and on the basis of test reports received from M/s Synthetics & Polymer Industries, Ahmedabad, two nos of shellac-based can coating lacquers were further refined and designated as CANLAC B00I and CANLAC C00I. The test reports from Regional Testing Laboratory, Ministry of Industry (Govt. of India) Kolkata, indicated that both CANLAC B00I and CANLAC C00I passed all the tests required for food grade and general line cans as per IS:5818 (1988) specifications for oleoresinous lacquers. The results are summarised in Table 17.

Further work is in progress in refining two other compositions, CANLAC A00I and CANLAC D00I which are based on different synthetic resins and dewaxed lac.

UTILISATION OF BY-PRODUCTS (LAC DYE, WAX, REFUSE LAC) OF LAC INDUSTRY FOR FOOD GRADE LAC DYE, VARNISHES/LACQUER AND BONDING FOR PARTICLE BOARD

Varnish composition based on aleuritic acid - free gummy mass

It was reported last year that two compositions of insulating varnishes based on gummy mass and a synthetic resin were

Table 17 Characteristics of can lacquer based on dewaxed shellac and synthetic resin

Test	CANLAC B00I	CANLAC C00I
Stoving schedule	20 min/200°C	20min/200°C
Finish (without additional pigmentation)	Attractive 'gold' finish	Attractive 'gold' finish
Viscosity (Sec. by Ford Cup No. 4 (spray composition))	182	47
Flash Point (°C)	>27	>27
Flexibility/Adhesion	Passes	Passes
Scratch hardness (g)	>1500	>1500
Impact resistance	Passes	Passes
Gloss (%)	100	100
Acetone rub test	Passes	Passes
Acid resistance test	Passes	Passes
Sulphur resistance test	Passes	Passes
Flavour test	Passes	Passes
Test for shelf-life (Six month)	Passes	Passes

developed, which showed high dielectric strength and thermal resistance of the order of 240°C. During the period under report, experiments were conducted on the electrical properties of baking type varnishes prepared by blending of solutions of gummy mass and a synthetic resin in the cold and melt-mixing of gummy mass and the synthetic resin. No marked difference was observed in the dielectric strength values of varnishes prepared by the two methods. Dielectric strengths of the films in air and after immersion in water for 24 h. were found to be in the range 86-90 and 39-63 kV/mm respectively (corresponding B.I.S. requirements of BDS are 50 and 35 kV/mm respectively). Films were smooth, non-tacky, dark and hard. The baked films showed thermal resistance (tested) up to 240°C. The melting profile of baked films was investigated by D.S.C. The characteristic peaks of shellac around 52-57 and 72-74°C were absent. This indicated that some chemical reaction had taken place between the gummy mass and the synthetic resin. The films also passed the tests for resistance to tracking, transformer oil and effect on enameled wire (>16, pencil hardness >6H). Fibre glass reinforced laminated sheets (10 x 10") are being prepared using needle-type fibre glass mats and the baking type of varnish described above for evaluation of their mechanical properties.

Development of lac wax-based formulations

It was reported last year that eleven emulsion formulations were prepared based on lac wax, carnauba wax, paraffin wax, bleached lac for use as protective coating of fruits and vegetables. These formulations, having solid content of approx. 15%, were studied for their stability at room conditions. It was observed that the stability of these formulations was not satisfactory except composition No. 5 and No. 6 prepared by using lac wax and bleached lac. Separation of layer took place after 48 h. although it mixed again on shaking to give the emulsion.

Keeping in view of the suggestion made by RAC, five fresh emulsion formulations based on lac wax and bleached lac were prepared by

increasing the solid content from 15 to 25%. In all cases, the mixture of lac wax, bleached lac and other ingredients, were taken in a preheated stainless steel beaker dipped in an oil bath at 100-105°C and the water based emulsions were prepared under constant stirring for a period of five hours. These emulsions were found to be quite stable for more than a week.

Attempt is being made to create facilities at the Institute for testing of physical, biochemical and microbial changes undergone in some selected vegetables and fruits as a result of coating with emulsion formulations.

In order to prepare suitable general purpose polishing formulations for leather, metal, automobile and wood, using lac wax, carnauba wax, stearic acid and water with some emulsifying compounds, it was observed that emulsion prepared based on lac wax (5%) carnauba wax (5%) and water (87%) containing an emulsifier (3%) was quite stable. The preparation of polishing compositions using these emulsion formulations, is in progress.

Use of refuse lac/by-products/modified lac for making particle board/composite from various growwastes

The woody waste materials of lac factories as described earlier (*Ann. Rep.* 1999-2000) were used in making particle boards of good surface finish by adopting three layer mat formation technique. The woody waste materials formed the core layer without any external binder as it contained considerable amount of lac. The outer surface layers were formed by *arhar* or *bhalia* stick particles and aleuritic acid free gummy mass mixed with shellac as binder. In the above mat formation, the ratio 60:40 by weight of the woody wastes of lac factories and *arhar/bhalia* stick particles were found to give particle boards of good surface finish. Different properties of the above particle board are shown in **Table 18**.

An attempt was made to try gummy mass in combination with synthetic resin generally used in making particle boards. For this purpose, different proportions of gummy mass were mixed with the thermosetting powdered phenolformaldehyde (PF) resin and particle

boards (130x130x12mm) were made, using 12% of the above binder compositions. The impact strength, thickness swelling and water absorption behavior of the above particle boards were studied. The results are given in **Table 19**. An increase in the thickness swelling and water absorption values of the particle board was noticed with the increase in proportion of gummy mass in the binder composition. It was, however, observed that the binder composition with 30-40% gummy mass in combination with PF resin did not adversely affect the impact strength of particle board compared to that made by PF resin alone. The impact strength was observed to decrease (**Table 19**) with higher percentage of gummy mass. The result thus indicates that gummy mass can also be used in combination with PF resin in the manufacture of particle boards. Further work is in progress.

Table 18 Characteristics of particle boards made using the woody waste materials of lac factories

Characteristics	
Thickness	12 mm
Density	0.69 g/cc
Impact strength	1.6 cm.kg/cm ²
Tensile strength parallel to surface	3.1 N/mm ²
Modulus of rupture	36.6 kg/cm ²
Screw withdrawal force (Face)	41.0 kgf
Thickness swelling (24 hrs.)	20.3%
Water absorption (24 hrs.)	69.1%

Table 19 Effect of gummy mass on impact strength, thickness swelling and water absorption of particle boards made using phenol-formaldehyde (PF) resin (Binder Content 12%)

Gummy mass : PF resin	Impact strength cm kg/cm ²	Thickness swelling (%)		Water absorption (%)	
		2 hrs	24 hrs	2hrs.	24 hrs.
00:100	3.5	12.8	16.4	43.7	57.8
30:70	4.0	20.5	23.4	58.0	77.2
40:60	3.6	24.6	28.9	63.3	78.8
50:50	2.7	32.7	38.1	69.2	90.8
60:40	2.4	51.9	63.4	100.6	122.9
70:30	1.8	68.3	87.6	149.4	184.1

Mechanisation of *bhatta* process for production of shellac/button lac

Bhatta process is the traditional method of manufacturing shellac/button lac from seedlac at cottage industry level. The process of making *bhatta* shellac is based on hot filtration technique in which a cloth bag containing seed lac is heated in front of an oven and after series of different operations, shellac sheet or button lac is produced. The present work has been initiated for design and development of a machine to mechanise the process which will result in higher production, reduce health hazard and drudgery of people involved in this type of work.

The different operations of *bhatta* process were analyzed for determining the operational and physical parameters. The important parameters are, time duration for processing span length (15-18 minutes), maximum temperature (70-100°C) and span length (120-130 cm). Three different chambers have been designed for different operations, which are performed in *bhatta* process. These are, main heating chamber (135 x55x35 cm³), *kiri* chamber (35 x35x35 cm³) and product chamber (40x40x35 cm³) for performing operations like melting of seedlac, *kiri* removal and product formation respectively. Heat transfer analysis has been done for minimizing the heat losses upto 10% through insulated surfaces of different chambers.

The convective mode of heat transfer has been selected for melting of seedlac because it provides uniformity and control of temperature inside the chamber. For this purpose, a hot air blower system (capacity -2 KW), connected with the main chamber, has been designed with thermostat control, and provision of recirculation of hot air through a rectangular duct of (14x15 cm²) size and 105 cm of length. The recirculation line, driven by an outside motor, has been specially designed for saving heat energy and providing uniformity of temperature inside the chamber.

The maximum diameter of the filter bag, which the main heating chamber can accommodate, has been found out for

determining heater output and designing scraper mechanism. A roller assembly of spur gear has been designed for feeding of seedlac bag through the main and *kiri* chambers. For squeezing of bag and scraping of molten lac from bag, a scraping mechanism has been designed of inner dia. 11 cm and outer diameter 25 cm, with variable opening. A separate squeezing mechanism has been designed for removal of *kiri* from *kiri* chamber. Further work of designing removal system of product and development of designed parts of machine is in progress.

Adhoc Research Scheme

Polyblends of shellac with synthetic resins / polymers - formulation, characterisation and application studies

The results of the studies on the development of two compositions of high-thermal-resistant baking-type insulating varnishes based on shellac and two synthetic resins, ShAKDB (Comp. 1) and Sh05XB (Comp. II) have been reported earlier. The synthetic resins used were designated as 1 and 2 respectively. During the period under report, electrical and other properties were investigated for compositions prepared by blending different proportions of solutions of shellac-synthetic resin 1 and shellac synthetic resin 2 separately. No marked difference was observed in the dielectric strength (tested in air). But, variation was observed in the dielectric strength of films tested after immersion in water for 24 hrs. for shellac-synthetic resin 1 compositions. The bi-resin formulations produced non-tacky, hard and flexible (3 mm mandrel) films, but the films became brittle with the increase in the shellac content (unmodified shellac films are brittle) and the films became tacky with the increase in the synthetic resin content. The tackiness, however, could be overcome by increasing the baking time.

The films of shellac-synthetic resin 1 compositions yielded 'hammer tone' finish in thicker coatings. In case, this type of finish is not liked by consumer and since synthetic resin 2 is dearer, attempts were made to formulate 'ter'-resin compositions. The films of all the 'ter'

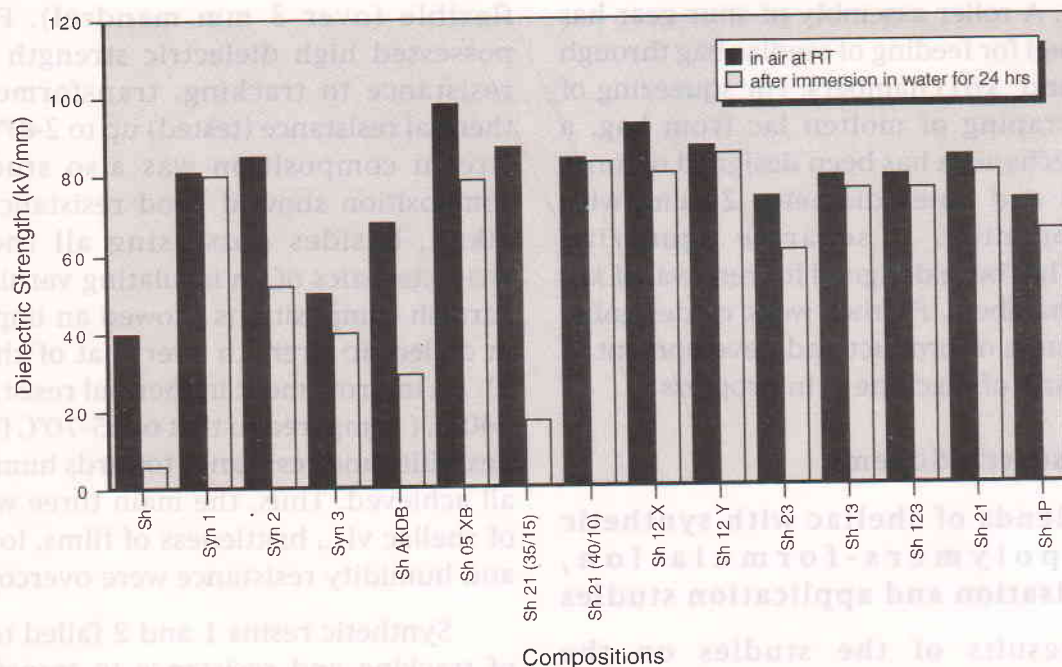
compositions were smooth, hard, non-tacky and flexible (over 3 mm mandrel). Films also possessed high dielectric strength (Fig. 1), resistance to tracking, transformer oil and thermal resistance (tested) up to 240°C. A 'tetra' - resin composition was also studied. The composition showed good resistance towards alkali, besides possessing all the desired characteristics of an insulating varnish. All the varnish compositions showed an improvement in dielectric strength over that of shellac (Fig. 1). An improvement in thermal resistance up to 240°C. (compared to that of 65-70°C for shellac) flexibility and resistance towards humidity were all achieved. Thus, the main three weaknesses of shellac viz., brittleness of films, low thermal and humidity resistance were overcome.

Synthetic resins 1 and 2 failed to the tests of tracking and resistance to transformer oil respectively. Films of all the blends, however, passed the tests. Thus, shellac contributes to the improvement in the above properties of these synthetic resins. Films possessed scratch hardness of more than 2000 g. The hardness obtained, in regard to the test on the effect of varnish on enamelled wire for all compositions, were (>16) found to be better compared to the hardness values of three commercial varnishes which were found to be 2H, 5H and 6H respectively. Two of the varnishes developed were evaluated locally. The performance of the varnishes have been reported to be satisfactory when applied on the coils of 6.6 kV 750 kW and 3.3 kV 400 H.P. electric motors.

In the above formulations, it was observed that kerosene could also be used as a cosolvent. Dielectric strength in air and after immersion in water were found to be 93 and 55 kV/mm respectively. No adverse effect has been observed on other properties.

One of the varnishes (Sh05xB) was coated on aluminium alloy based sole plates of electric irons and were subjected to domestic use. No removal of coating was observed up to nine months. The cost of the coating is less and method of application is convenient compared to the commercially available coatings.

Fig. 1 Dielectric strength values of different 'bi', 'ter, and 'tetra' resin compositions



Current status, technology assessment, product promotion and problem of lac industries

During the period under report, a survey was conducted in some lac processing units in the areas of Gondia (Maharashtra), Dhamtari, Sakti (Chhatisgarh) and Balrampur (W.Bengal), to find out the current status of lac industries and their problems.

Gondia

There are six lac manufacturing units. Total annual production is about one thousand tonnes (seedlac, buttonlac and shellac) which is mostly consumed internally.

Dhamtari

There are ten lac manufacturers. Their annual production is also around one thousand tonnes (seedlac, bleached lac, button lac). The main product is seedlac. Manufacturers are facing problems in drying of seedlac during rainy season.

Sakti

There are three lac processing units. They manufacture around 600 tonnes of seedlac, tonnes of bleached lac and 200 tonnes of shellac.

Balrampur

There are 10 machine made and 110

handmade shellac manufacturing units running currently in Purulia district. Out of these, there are four exporters also.

Problems of Lac Industries

Lac industries are facing problems of disposing of lac effluents. There is an urgent need for solving this problem. The disposed water should be non toxic, non-hazardous, ecofriendly and should meet the specifications, laid down by the state environment departments.

There appears to be a need to reformulate the shellac gasket compound similar to other industrial products e.g., Holdfit manufactured by a Mumbai-based firm, to be used for sealing of pipe joints.

Traders are receiving low quality sticklac due to either untimely harvesting or adulteration. A short term training programme in lac cultivation and post harvest technology for lac growers may be organised for a specified period. There is no uniform taxation system by the different State Governments. All manufacturers desired "turn-key projects" on different products. M/s Vishnu Shellac Factory has started manufacturing bleached lac and lac wax but they are facing problems related to the quality of the finished products.

REVOLVING FUND SCHEME

Quality Broodlac Production on *Kusum* and *Palas*

BALANCE SHEET 2000-2001

Fund Received from ICAR in Nov. 1996 :	Rs. 6,70,000
Opening Balance (Cash) on 1st April 2000 :	Rs. 7,74,235
<hr/>	
EXPENDITURE (Rs.)	INCOME (Rs.)
HEAD	HEAD
Broodlac 39,650	Broodlac/(+Syn.) sold 83,035
Contractual (Labour) 50,240	Arrear cost of broodlac —
Insecticides 6,363	Sticklac 10,870
T.A. —	Broodlac used for next year 63,115
P.O.L. —	
Total 96,253	1,57,020
HEAD	Up to MARCH 2000
Gross Profit (+) / Loss (-) 60,767	60,767
Minus 10% of Worker's Share NIL	NIL
Establishment Charges NIL	NIL
Depreciation 1,694	1,694
Net Profit 59,073	59,073
<hr/>	
Cash Reserve as on 31st March 2001 as per cash book	Rs. 8,18,185
NR assets	Rs. 9,981
Broodlac used for future crop	Rs. 63,115
Total	Rs. 8,91,281

Note *Lac* cultivation has been initiated on 200 palas trees at Angara and 400 kusum trees at ILRI Farm for boosting broodlac production under the scheme.

EDUCATION AND TRAINING

Certificate Course on Modern Methods of Lac Culture



Participants of special course on lac culture, from IFP, Ranchi

A total of 12 unemployed rural youth successfully completed the 4 month training. Four Lac Supervisors, and five Statistical Supervisors of the Institute of Forest Productivity, Ranchi also successfully completed a special training programme on "Scientific Method of Lac Cultivation" for 45 days.

Training Programme for Farmers and Housewives

The Institute conducted one-week and one-day training programmes, with special emphasis on lac culture. One-week programme mainly consisted of lac cultivation, processing at farm level and utilisation of lac at village level. One-day training was aimed at to educate the existing lac farmers regarding scientific lac culture and suggested remedial measures of their problems. A summary of one week and one day training programmes conducted during the period is furnished in Tables 19 and 20 respectively.

One-day Education Programme on lac

One-day programme on lac cultivation was organised for batches of Post Graduate/Graduate students as per details given in Table 20.

Table 19 One-Week Training Programme on lac culture and other aspects

Sl. No.	Sponsoring Organisation	Period	No. of Participants
Farmers training			
1.	TRIFED, Ranchi (Nominated by Jan Vikas Kendra Munda Dev. Community)	24-29 Jan 21-26 Feb 4-7 April	20 11 12
2.	Agriculture Training Centre, Ranchi	10-17 April 30 Oct.- 4 Nov.	4 3
3.	Nav Bharat Jagriti Kendra	5-10 June	11
4.	Society for Rural Industrialisation, Ranchi	30 Oct - 4 Nov	11
5.	R.K. Mission Ashram Narendrapur, Kolkata	27 Nov - 2 Dec.	7
Total			79

Special One-week Training Programme

1.	BHU (B.Sc. Ag. students, BHU Institute of Agri. Sci.)	12-17 June	22
Grand Total			101

Table 20 One-day Orientation Programme on Lac

Beneficiary	Sponsored by	No. of batches	No. of Participants
Orientation Programme			
Farmers	R.K. Mission, Ranchi	7	337
	Nav Bharat Jagriti Manch, Murhu, Khunti, Ranchi	1	17
	Wish Care	2	45
	Support for Sustainable Society, Gumla	1	30
	Agriculture Training Centre, Ranchi	1	23
	SRI, Ranchi	2	30
Total			482
One-day Education Programme			
Students	St. Columbas College, Hazaribagh	2	23
	BAU, Ranchi	1	54
	Allahabad Agric. Institute, Allahabad	1	12
	DAV Kapildeo School, Ranchi	1	13
Total			102
Grand Total			584

Taking into consideration of the demand from the farmers, field education programmes on Lac Culture were organised in association with various NGOs as given in Table 21.

Table 21 Field education programmes conducted on lac cultivation

Venue/Village	State	Collaborating Organisation	No. of Participants
Off-campus Extension Education Programme			
Arki Block, Ranchi	Jharkhand	Alternative for Indian Dev. (AID)	69
CCF Project, Dorma	Jharkhand	CCF Project	48
Ormanjhee, Ranchi	Jharkhand	Chakriya Vikas Sansthan	20
Garebir, Silli, Ranchi	Jharkhand	Parvatiya Durgam Siksha Vikas	50
Kaparya, Khunti, Ranchi	Jharkhand	Jan Utthan Kendra	63
Govindpur and Muchidih, E. Singhbhum	Jharkhand	Tata Steel Rural Development Society, Jamshedpur	75
		Total	325
On-farm Training Programme			
Chhatapara & Labeed (Korba)	Chhatisgarh	Vishnu Shellac, Sakti,	18
Kofarmar & Jobi (Raigarh)	Chhatisgarh		14
Hahap & Libudih (Ranchi)	Jharkhand	Rastriya Ekta Abhiyan	20
Barsoguda, Futanoda & Binaypur (Raigarh)	Jharkhand		30
Chikli & Chachamar (Jharigram)	Orissa	Collector, Nabrangpur	52
Rajkot, Bandhakona, Baidpada, Pathkalya, Dalabeda & Bhattipada (Chandahandi)			40
Hud (Ranchi)	Jharkhand	AID, Ranchi	24
			18
			10
			20
			50
			40
			40
			35
			10
			57
			23
		Total	501

Kisan Gosthi

S.S. School, Silli Ranchi	Jharkhand	INDAL, Muri	1000
Getalsud Ranchi	Jharkhand	R.K. Mission	500
Ex-trainees Sarmelan, Ranchi	Jharkhand	R.K. Mission	500

One-month vocational training programme

As a part of the Entrepreneurship Development Programme on lac, demonstration was given for the preparation of lac dye to an entrepreneur at Sakti (Chhatisgarh). One month vocational training programme was also conducted for entrepreneurs sponsored by Institute of Entrepreneurship Development (Bihar), Ranchi in which demonstrations were arranged for manufacture of French polish, water soluble lac, sealing wax and processing of lac. They were also trained on testing and analysis of lac.

Product/Process	No. of trainees	Beneficiary	Sponsored by
Lac Processing, French polish, water soluble lac, sealing wax and testing and analysis of lac	25	Entrepreneurs	IED, Bihar, District Industries Centre
Lac dye	1	Shri V. Agarwal at Sakti	—

Project Training

Nine students of B.Sc. Hons. (Biotechnology) from Centre for Biotechnology, Marwari College, Ranchi underwent project training at Tissue Culture Laboratory of Lac Production Division of the institute, from 20.08 to 25.11.2000 under the guidance of Sri D. Saha, Scientist (Biotechnology).

PUBLICITY

Participation in Exhibitions and Kisan Melas

The institute participated in a number of exhibitions/*kisan melas* as shown in Table 22.

A large number of visitors were benefited from the exhibits of the stall. Literature on lac was also distributed among the interested persons.

Technical Information Service

Technical information in respect of lac products/processes and other general informations were provided to interested persons including lac entrepreneurs/other agencies. A large number queries were attended to during the period.

Supply of Samples and Sale Counter

During the period under report, 213 kg of water soluble lac was prepared in which 200 kg was supplied to W. Bengal Government and rest

was for exhibition and sale counter of TOT. About 29 litres of Melfolac was also prepared for exhibition-cum-sale. 50 g lac dye has been sent to Shri Vivek Singhania, Purulia and 10g to CFTRI, Mysore (Karnataka).

The TOT Division operates a sale counter for promotion of lac-based products. Various products, such as melfolac, water-soluble lac, lac handicrafts, etc. were sold amounting to Rs. 33,728 during the period.

Infrastructure development

Portable kits have been purchased for attractive display of materials in exhibitions, *kisan melas* etc. A specially designed exhibition van has been procured for field exhibitions.

Publicity through Mass Media

'*Lah utpadan mein dhyan dene wali baatein-I*', By Dr. K.K. Sharma, telecast from DDK, Ranchi on 12.02.2000.



Lac stall at India International Trade Fair, New Delhi

'Chhotanagpur ke vikas mein lakh ka yogdan', By Dr. K.K. Sharma telecast from DDK, Ranchi on 26.04.2000.

'Lah utpadakon ko milne wali suvidhayein', By Dr. K.K. Sharma telecast from DDK, Ranchi on 09.09.2000.

'Lah utpadan mein dhyan dene wali baatein-II', By Dr. K.K. Sharma telecast from DDK, Ranchi on 04.09.2000.

'Lakh keet palan ki vaigyanik vidhi', By Dr. P. Kumar, telecast from DDK, Ranchi on 06.12.2000.

Table 22 Participation in Kisan Melas and Exhibitions

Date	Name and location of the exhibition	Organized by
8-9 Jan. 2000	Kisan Mela, Khunti, Ranchi Dist.	S.D.O., Khunti
18-20 Jan. 2000	Central Annual Kisan Mela, KVK, Getalsud Farm, Angara block, Ranchi Dist.	RK Mission Asrama
2 Feb. 2000	Kisan Mela, SS High School, Silli	Indalco, Chotamuri
28 Feb. 2000	Agro-Tech, BAU, Kanke, Ranchi	Pathari Vikas Pariyojana, Ranchi
11-13 Mar. 2000	Exhibition at Gamarkuri, Kashipur, Purulia, West Bengal	NGOs, Gamarkuri
30-31 Mar. 2000	Exhibition, training and demonstration, Hosenghatu and Soraringhatu villages, Arki block, Ranchi	Alternative for India Development, Ranchi
17 May 2000	Training-cum-exhibition on lac and lac technology at Dorma, Ranchi	Christian Children Project Fund, Dorma
8 Sept. 2000	Exhibition-cum-field education, Karparya Village, Khunti, Ranchi	Jan Utthan Samiti, Ranchi
18-19 Sept. 2000	Appropriate Technology Exhibition for Handloom Sector at Gorakhpur, UP	National Handloom Development Corporation, Lucknow and Directorate of Handloom and Textile, UP Govt.
3 Oct. 2000	Exhibition on Lac Culture & Lac Products Village - Govindpur, Dist. - East Singhbhum	TISCO Steel Rural Development Society
4 Oct. 2000	Exhibition on Lac Culture & Lac Products Village - Muchidih, Dist. - East Singhbhum	TISCO Steel Rural Development Society
14-27 Nov. 2000	India International Trade Fair 2000, Pragati Maidan, New Delhi	Trade Fair Authority of India, New Delhi

Popular Articles

1. Sharma, K.K. (2000) Lakh ki kheti se jaldi madhumakkhi palan ki kambhawan. Panchajanya, 1 (2), 37-39.

2. Sharma, K.K. and Jaiswal, A.K. (1999) Bharatiya Lakh Anusandhan Sansthan Ake panunchhi hai kisanon ke upayon lak. Hamari Bar. Panchajanya, 1 (1), 32-33.

3. Kumar, P. (2000) Lakh keet palan ki vaigyanik vidhi. Panchajanya, 1 (Jan-March): 39.

Kumar, S. and Malik, A. (2000) Genetic variation in some productivity linked traits of female lac insects *Kerria* spp. (Homoptera: Tachardidae). J. ent. Res., 24 (2), 121-124.

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Bhattacharya, A., Sushil, S.N., Jaiswal, A.K. and Kumar, P. (2000). A suitable egg laying substrate for *Pseudohypatopa pulverea* Meyr. (Lepidoptera: Blastobasidae)- a serious predator of lac insect, *Kerria lacca* Kerr, *Journal of Applied Zoological Researches*, 11 (2&3), 155.

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2. Sharma, K.K and Jaiswal, A.K, (1999) *Bhartiya Lakh Anusandhan Sansthan: Aise pahunchti hai kisanon / udyamion tak Hamari Batt*. *Pathari Krishi*. 1 (1), 32-33.
3. Kumar, P. (2000.) *Lakh keet palan ki vaigyanik vidhi*, *Pathari Krishi*, 1 (Jan.-March): 39.

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1. Sharma, K.K. and Ramani, R (eds.) 1999., ILRI Newsletter, Four issues i.e., Vol. Nos. 3 (4), 4 (1), 4 (2), and 4 (3) have been published during the year.

Folders and pamphlets

1. A heat and waterproof shellac varnish for wooden furniture was prepared along with a scheme for new entrepreneurs (Platinum jubilee of ILRI).
2. A lac based hot-melt adhesive was prepared for new entrepreneurs (Platinum Jubilee of ILRI).
3. CANLAC-Lacquer for internal coating of tin cans (Platinum Jubilee of ILRI).

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1. Sharma, K. and Ramani, R. (eds.) 2000. *Lakh utpadan ki unnat vidhi avum upyog (Prashikshan Pustika)* in Hindi, 47 pp.
2. Sharma, K. Krishan, Sushil, S.N., Jaiswal, A.K., Ramani, R. and Kumar, K.K. 2000. World literature on lac-culture and related aspects (1980-2000) 53 pp.

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Bhattacharya, A. (2000) *Kharab mausam mein lakh phasal ki suraksha in : Lakh utpadan ki unnat vidhiya avum upyog, Prashikshan Pustika*, edited by K.K. Sharma and R. Ramani, pp. 32-33, Indian Lac Research Institute, Ranchi, 47p.

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- ILRI Newsletter October-December 1999, January-March 2000, April-June 2000 and July-September 2000

- Prashikshan Vivarnica in Hindi, a brochure
- Training Prospectus, a brochure
- Heat and Water Proof Varnish, a folder, 4 pp
- Lac-based Hot-melt Adhesive, a folder, 4pp
- Exaltone for Perfumery Industry, a folder, 4pp
- Canlac-lacquers for Internal Coating of Cans, folder, 4pp
- Advanced technologies for Lac Production on Palas in Hot Areas, ILRI Bulletin No. 3, 8 pp
- Souvenir-ILRI Platinum Jubilee Symposium "Lac in the New Millennium", Sept. 20-21 2000, a book, 130 pp
- World Literature on lac-culture and related aspects (1980-1999), a book, 53 pp
- Lac cultivation Promotional Multicolour Posters with Slogans, 6 nos.

3. Development of value-added products (sex pheromone, PGR, polyhens) and surface coating materials from lac resin

- Synthesis of some bio-active compounds from abietic acid
- Development of lac varnish for wood and metal lacquer for food packaging

4. Utilization of by-products (lac dye, wax, refuse lac) of lac industry for food grade lac dye, varnishes/lacquer and bonding for particle board

- Varnish composition based on abietic acid-free gummy mass
- Development of lac wax based formulations
- Use of refuse lac/by-products/modified lac for making particle board/composite from various agro-wastes
- Mechanisation of plant process

2. Transfer of technology to farmers and entrepreneurs through training, demonstration, consultancy, information service and quality certification

- Mechanisation of lac cultivation operations
- Publication and publicity activities
- Current status, technology assessment, product promotion and problems of lac industries
- Training, demonstration, extension education and information service on lac culture, processing and product development

Approved Ad hoc Research Schemes

- Lac productivity rating of different lac insects on conventional and promising lac hosts
- Polyhens of shellac with synthetic resins/polymer - formulation, characterization and application studies
- Pilot study on forecasting of broodlac yield from palas (Butea monostachya)

Revolving Fund Scheme

- Production of quality broodlac on keum and palas in different agro-climatic regions

LIST OF APPROVED ON-GOING PROJECTS

1. Evaluation and improvement of lac crop management practices under integrated agro-forestry system covering soil, host plant and pest management

- To evolve management practices of *kusmi lac* production on *ber*
- Bio-rational approaches for management of pests of lac insects and host plants
- Management of important lac hosts under agro-forestry system for *kusmi lac* production
- Management of *akashmani* (*Acacia auriculaeformis*) for lac cultivation
- Nutrient Management in soil for maximising lac yield
- Management of *Flemingia semialata* for sustainable lac production under different crop geometry and irrigation

2. Improvement in productivity and quality of lac through different breeding approaches for insect and their host plants

- Collection, maintenance, conservation and evaluation of lac insect and host plant and their genetic improvement

3. Development of value-added products (sex pheromones, PGR, polyblends) and surface coating materials from lac resin

- Synthesis of some bio-active compounds from aleuritic acid
- Development of lac varnish for wood and metal lacquers for food packaging

4. Utilisation of by-products (lac dye, wax, refuse lac) of lac industry for food grade lac dye, varnishes/lacquer and bonding for particle board

- Varnish composition based on aleuritic acid-free gummy mass
- Development of lac wax based formulations
- Use of refuse lac/by-products/modified lac for making particle board/composite from various agro-wastes
- Mechanisation of *bhatta* process

5. Transfer of technology to farmers and entrepreneurs through training, demonstration, consultancy, information service and quality certification

- Mechanisation of lac cultivation operations
- Publication and publicity activities
- Current status, technology assessment, product promotion and problems of lac industries
- Training, demonstration, extension education and information service on lac culture, processing and product development

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Revolving Fund Scheme

- Production of quality broodlac on *kusum* and *palas* at different agro-climatic regions

PARTICIPATION OF SCIENTISTS IN TRAINING, MEETINGS, SYMPOSIA ETC.

Attended by Director

- District Level Advisory Committee Meeting on lac with Shri Basudeb Acharya, M.P., Purulia on 17-18 April 2000.
- 272nd Meeting of SEPC at Kolkata on 19-20 April 2000.
- Regarding setting up a Standing Conference of Ranchi based organization for R&D activities in the field of ecology, forestry, environmental planning & management held at Institute of Forest productivity, Hinoo, Ranchi on 25-26 May 2000.
- Attended Board of Directors Meeting of BISCOLAMF, Ranchi on 3 July 2000.
- 274th Meeting of SEPC; to discuss with the Official Liquidator reg. Court case of Lac Product Area; visited NIRJAFT, Kolkata on 13-15 July 2000.
- Scientific Panel meeting (Agril. Engg.) held at IASRI, New Delhi on 27 July 2000.
- Programme Level Workshop at Society for Rural Industrialisation, Bariatu, Ranchi on 9 August 2000.
- Second SITE Committee meeting of NATP at B.A.U. Kanke, Ranchi on 18 August 2000.
- Discussion with Swamiji, RK Mission, Purulia regarding shifting of RFRS, Balrampur to Purulia; visit to RFRS, Balrampur on 12 Sept. 2000.
- Directors Conference, pending cases of the Institute; approval of IMC Proceedings and National Symposium on "Lac in the New Millennium" held on 20-21 Sept. 2000 on 11-16 Oct. 2000.
- 277th Committee meeting of SEPC, at Kolkata on 17-18 Oct. 2000.
- The 1st meeting of R.A.C. of CTR & TI held at Ranchi on 15-16 Dec. 2000.
- Seminar organized by CIRCOT, Mumbai; explore the possibility of lac by-products (Kiri, Molamma, Pasewa) as binding material in

particle board of cotton stock & lac dye in textile industries on 21-25 Dec. 2000.

Attended by Scientists and other Staff members

- Mr Ashish Rastogi, Administrative Officer, attended the first interactive workshop and brainstorming session under O & M of NATP for Administrative and Finance functionaries of ICAR at NAARM, Hyderabad from 13 th to 17th February, 2000.
- Dr S N Sushil, Dr P Kumar participated and presented a paper entitled, 'Bio-diversity in lac culture - a natural Heritage of India authored by Sushil SN, Mishra YD Kumar P, Ramani R and Kumar KK in the seminar on Indigenous knowledge and Intellectual Property rights at BAU, Ranchi on 23.2.2000
- Dr KM Prasad participated in the workshop on 'The use and need of eco-friendly natural dyes over the synthetic banned azo dyes' organised by national Handloom Development Corporation, Lucknow during Feb. 22-26, 2000 at Kunnur (Kerala). Dyeing of wool & silk with lac dye was also demonstrated to participate during the workshop.
- Dr P Kumar, Pr Sc and Head, Lac Production Division and Dr KK Sharma, Sc. (Sr. Scale) participated in a NATP (Plant Biodiversity) zonal Workshop of zone VIII on 4-5 March 2000, held at RAU, Pusa, Samastipur.
- Dr. SN Sushil, Dr P Kumar, Dr KK Kumar and Dr A Bhattacharya participated and presented a paper, 'Lac culture - a solution in Joint Forest management' in the seminar on Challenges of Administration in the Tribal Area of the Eastern Region, held on 10-12 March, 2000 at Marwari College, Ranchi. Mr. YD Mishra also was a co-author.
- Dr KK Sharma presented a paper, 'Lac - a potential minor forest produce' authored by A Bhatthacharya, SN Sushil, KK Sharma, P Kumar and KK Kumar in Symposium on 'The

impact of minor produces on benefit-cost analysis in environmental impact assessment studies held on 16.3.2000 at AN Sinha Institute of Social Studies and organised by Yugantar Bharati.

- A tour was undertaken by Dr KM Prasad and Mr Radha Singh to Gondia, Dhamtari & Sakti during 6-10 March 2000. Discussion was held with lac manufacturers and traders of Gondia, Dhantari and Shakti. Questionnaire was distributed among them for studying the current status, technology assessment and problem of lac Industries.
- Dr A Bhattacharya, Sr Sc visited Defence Research Laboratory, Tezpur and TRIFED, Guwahati during March 30 to April 2, 2000 in connection with the promotion of lac cul-

tivation in the NEH Region. He held discussion with the officials of DRI, Tezpur and TRIFED, Guwahati and has prepared an action plan for carrying out lac cultivation in the region during 2000-01.

- Dr. A.K. Jaiswal Scientist (Sr. Scale) participated in Technical Seminar organized by State Polytechnic, Ranchi and Bhartiya Vipanank Vikash Kendra, Ranchi at Govt. Polytechnic, Ranchi on 11th December, 2000 and presented a paper on "Employment opportunities through lac cultivation and lac based cottage industries for tribals".
- Dr. P.C. Sarkar, Scientist, attended a Seminar on "Internet & Beyond" organised by Computer Society of India at SAIL RDCIS, Ranchi on 5th December 2000.

PROMOTION OF LAC CULTIVATION IN NEH REGION

A visit to Tezpur, Guwahati and adjoining areas were made by Dr. A Bhattacharya, Senior Scientist of Div. of Lac Production, during March 2000 for observing the crop condition inoculated during the last season. The *kumsi* lac insects inoculated on *ber* in Tezpur area was performing well and was following the similar cycle as in the region. Mortality in the *rangeeni* crop was recorded as the broodlac taken from Ranchi did not survive beyond the male insect emergence period.

An action plan for promotion of lac cultivation in NEH region was formulated in consultation with the officials of Defence Research Laboratory (DRL), Tezpur and TRIFED, Guwahati.

During May-June 2000, a visit to NEH region was made by Dr. A Bhattacharya and Dr. K K Sharma. A training programme on lac was organised at Amsoi in association with an NGO and TRIFED, which was attended by about 45 Karbi tribals of Karbi Anglong District.

Training-cum-demonstration programmes were organised at five villages in Kokrajhar area in association with an NGO and TRIFED. During the training programme, about 75 Bodo tribals were explained about the systematic methods

of lac cultivation, demonstration were given for pruning of *ber* trees and about 13 kg of broodlac (collected from Amsoi) was inoculated on the farmers' field. The farmers were also shown the video film on lac.

An extensive survey was also undertaken in Karbi Anglong, Nagaon and Kokrajhar districts and visits were made in the lac growing areas in Karbi Anglong district. Information was gathered regarding traditional methods of lac cultivation practiced by them.

The Scientists could meet the Hon'ble Tribal Minister, Sri Juel Oram at Guwahati and he was acquainted with the activities being carried out by the Indian Lac Research Institute for promotion of lac cultivation in the region.



Inoculation of ber tree



Training programme at Amsoi, Asaam

IMPORTANT COMMITTEES

Research Advisory Committee



RAC meeting is progress

The Seventh Meeting of the Research Advisory Committee of the Institute was held during March 22-23, 2001 at the Institute under the Chairmanship of Dr. B. L. Amla, Former-Director, CFTRI, Mysore. Members present in the meeting were : Dr. R. P. Kachru, Assistant Director - General (PE), ICAR, New Delhi; Dr. K. K. Kumar, Director, ILRI, Namkum, Ranchi; Dr. N. Krishnamurthy, Retd. Deputy Director, Head, Organic Coatings and Polymers Division, IICT, Hyderabad; Prof. D. R. C. Bakhetia, Retd. Senior Entomologist & Ex-Head, Dept. of Entomology, Punjab Agricultural University, Ludhiana; Dr. M. Yaseen, Retd. Deputy Director & Head Organic Coatings & Polymers Division, IICT, Hyderabad; Sri R. L. Sharma, Managing Director, Tajna Shellac (P) Ltd., Khunti, Ranchi; Mr. Madhu Agarwal, Secretary, Maharashtra Rajya Lah Utpadan & Chapra Nirmata Sangh, Gondia, Sri R. Ramani (Member-secretary), Senior Scientist, TOT Division, ILRI, Ranchi.

In his welcome address, Dr. K. K. Kumar, Director, ILRI highlighted the major achievements and activities of the institute during the preceding year. Dr. R. P. Kachru, ADG(PE), in his introductory remarks informed that ICAR is prepared to extend its full support to the Institute in fulfilling its mandate. He emphasized the need for strengthening the partnership with the industries to take up research in need-based areas. He suggested that a brain-storming session may be held to prepare

the 10th Plan document based on the lessons learnt in the past.

The Member-Secretary presented the action taken reports on the recommendations of the previous RAC meeting (3-4 Feb. 2000), received from various Divisions. The committee carefully reviewed them and gave specific suggestions for better output.

Dr. P. Kumar, Head Division of Lac Production presented the progress made under the projects of the Division. Respective Principal Investigators presented the progress under various projects of LP&PD Division. Shri R. Ramani presented the highlights of the work done by the TOT Division through multimedia presentation. Dr. D. N. Goswami, Shri YD Mishra and Dr A. K. Jaiswal presented the progress made under ad-hoc research schemes. The reports on Regional Field Research Stations were provided by Dr. S. K. Jaipuria and Dr S. Ghosal. There was a proposal for shifting the RFRS from Balarampur to Purulia, which was approved after deliberations.

Subsequently, there was an interaction of the RAC with the scientists of the institute, to discuss about the problems faced in their current research and future programme of work, especially, the Tenth Plan. Dr. Kachru summed up all points raised by various scientists of the institute, which covered the mandate, policy, management, lac crop failure, price fluctuation, etc. He said that a policy, paper on lac had to be prepared. He called for generating more data on lac, upscaling of viable projects, and development of turn-key projects.

As the current meeting was the concluding one for the committee, good words and reminiscent remarks were exchanged towards the end.

Shri R. Ramani, Member-Secretary, expressed his contentment over his experience with all the meetings held till then and the affectionate cooperation given by each and every member of the Committee. He expressed

his happiness over full presence of the Committee in all the meetings except the first one, in which Dr Krishnamurthi could not come due some unavoidable reasons. He reiterated that the RAC not only gave directions to the Institute but also helped in several ways to build up confidence among the scientists.

Some of the general recommendations which emerged during different sessions were :

- Work should be taken up to improve the economics of lac cultivation.
- Need for sensitizing the State Government for their support in lac production.
- Application of intensive or extensive cultivation would depend on the prevailing situation in the area. So, one has to study the local conditions to suggest appropriate strategy.
- Economic viability should be a in-built component of the output.
- The technologies developed at this institute should be perfected at pilot-plant level before transfer.
- Various organic reactions may be exploited using aleuritic acid as starting material.
- The product purity of synthesized/isolated compounds should be done employing latest techniques.
- The institute should contact suppliers of chemicals like Sigma, Aldrich etc. and work towards an arrangement for marketing of fine chemicals like, aleuritic acid prepared by the Institute. This could lead to impressive revenue generation as well.
- The institute should aim at giving at least one technology per year.
- Technology profile should be prepared for products developed. There should be internal evaluation by TOT Division.
- The institute should develop strong interaction with those industries, which are willing to cooperate with the institute.
- Application of a mercantile approach for promoting the products developed by the institute.

- Promising scientists should be deputed to visit CSIR labs, working in their areas of interest.
- Research Fellows/Associates should be hired for supporting the research work.
- Monthly seminars should be held where the scientist will review the relevant research findings in the journals allocated to him.
- About 10% of the library budget should be spent on purchase of useful reference books.
- SAUs, particularly, Entomology Divisions should be contacted for participation in the Summer Institute on Lac Cultivation to create wide awareness about the subject in the academic circle.
- It was suggested that 'Annual Kisan Mela' in future be called as 'Annual Lac mela.'
- "ILRI Newsletter" would be renamed as 'ILRI-Lac Newsletter.'

Institute Management Committee

XXIX Meeting

The meeting was held at the Institute on 6-7 April, 2000. The following members were present:

Dr. K. K. Kumar, Director	- Chairman
Dr. R. P. Kachru, Assistant Director-General (PE), ICAR, New Delhi,	- Member
Dr. J. B. Tomar, In-Charge, NBPGR Station, Ranchi.	- Member
Dr. P. C. Gupta, Head LP & PD Division, ILRI	- Member
Dr. G. Singh, Sr. Scientist ILRI, Ranchi	- Member
Sri S. K. Bose, F & A.O. CICFRI, Barrackpore, W. Bengal	- Member
Sri R. K. Singh, F & A.O. ILRI, Ranchi	- Member
Sri A. Rastogi, Administrative Officer, ILRI, Ranchi.	- Member- Secretary

Proceedings of the 28th meeting was approved by all members and were adopted.

Review of action taken report, on the recommendations of 28th meeting, was made. Shri R. Ramani was entrusted with the responsibility of design of the exhibition van.

The progress of research work of all the divisions was reviewed. ADG (PE) suggested that the significant coverage through media, publicity and propaganda should be arranged for the lac based technologies developed.

ADG also suggested that a committee of Heads of the Divisions should be constituted for organising a National Symposium on 20-21 Sept 2000 in connection with the Platinum Jubilee of the foundation of the Institute and a proposal may be sent to the Council for approval. It was also agreed to constitute a committee to prepare a proposal regarding crops to be grown in 2001, in respect of plan and non-plan expenditure, equipments to be procured and works to be executed.

XXX Meeting

The 30th meeting of the Institute Management Committee was held at the Institute during 17-18 August, 2000. The following members were present.

Dr. K. K. Kumar, Director	- Chairman
Dr. R. P. Kachru, Asstt. Director-General (PE), ICAR, New Delhi	- Member
Dr. J. B. Tomar, Incharge NBPGR Station, Ranchi	- Member
Dr. P. C. Gupta, PS & Head Division of LP & PD, ILRI, Ranchi	- Member
Sri G. Singh, Sr. Scientist, ILRI, Ranchi	- Member
Sri Md. Samiullah, for A.O., ILRI, Ranchi.	- Member- Secretary



IMC Meeting in progress

Dr. Kachru, ADG (PE), took keen interest and gave suggestions for celebrating the Platinum Jubilee of ILRI foundation in a befitting manner. Proceedings of the 29th meeting were confirmed after reviewing the action taken report.

The committee approved the equipments to be procured and items of works to be executed under the Catch-up grant.

The committee then reviewed the progress in the Research Projects, Adhoc Research Schemes, Revolving Fund and also progress in the NEH region.

IMC approved the financial support upto Rs. 6 lakhs for the Platinum Jubilee to be celebrated at the Institute.

Staff Research Council (SRC)

The SRC meeting was held on 27.1.2000 under the chairmanship of Dr. K. K. Kumar, Director of the Institute. The progress of all research projects was presented by the project leaders and thoroughly discussed. A few points of general interest were also brought to the notice of SRC and discussed.

The progress made in different Adhoc Research Schemes and Revolving Fund was also discussed.

SEMINAR, SYMPOSIUM ETC. ORGANISED

The Indian Lac Research Institute (ILRI) celebrated the Platinum Jubilee of its foundation during 20-21 September 2000.

A special symposium on 'Lac is the New Millennium' was organised on the Foundation Day of the Institute. The symposium aimed at bringing together all the agencies concerned with lac, taking stock of the ground realities and to evolve a pragmatic strategy for achieving the unified goal of sustainable lac production and boosting the demand of lac to a desirable level in the coming years.

The theme areas of the symposium covered all aspects of lac, including

- Lac culture, integration with other cropping systems for sustainable tribal upliftment, eco-system development
- Strengthening of domestic consumption
- Marketing and export promotion
- Value addition, product refinement and diversification
- Quality management
- Transfer of technology and
- Future Trends in Research and Development

The inaugural ceremony of the symposium was held in a specially erected pandal in the institute premises which was attended by over 700 persons. During the ceremony, Hon'ble Agric. Minister Shri Nitish Kumar; Hon'ble Members of Parliament Shri Ram Tahal Choudhary and Shri Raghunath Jha; local MLAs; Dr Anwar Alam, DDG (Engg.); Dr R.P. Roy Sharma, Vice-Chancellor, BAU; Dr R.P.Kachru, ADG (PE), ICAR; Former Directors of the Institute; Shri Prakash Thakkar, Chairman, SEPC; Dr S.K. Bhattacharya, Director, NIRJAFT ; other dignitaries and representatives from press and media were present.

Dr K.K. Kumar, Director of the institute welcomed the dignitaries and other esteemed participants. He outlined the historical



Inauguration of the Symposium by Hon'ble Union Agric. Minister Shri Nitish Kumar

development of the institute and informed the audience about the achievements of ILRI during 75 years of its existence in the areas of lac cultivation, lac refining, value-addition, lac-based products and extension activities. He apprised the viewers about the objectives of organizing the symposium.

Dr R.P. Kachru, ADG(PE), ICAR, while delivering his keynote address pointed out the existence of uncertainty in every sphere of lac trade. He stressed the importance of the minimum support price for lac, like other agricultural crops in the country, for better production and export. He felt that the thrust on indigenous production of value-added products and better utilization of by-products would make a favourable impact on the economy of lac industry. He also talked about glorious past of lac and its potential for future.

Shri Prakash Thakkar, Chairman, SEPC expressed his concern about the adverse effect of fluctuations in lac production, on the lac trade, due to crop failures. He also appealed for action from the concerned authorities for the removal of recently introduced tax on lac.

Shri Roshan Lal Sharma, a veteran lac industrialist and Member, RAC, ILRI apprised the audience about the huge demand potential for lac, problems faced by the industry and suggested means of realizing it.



Dignitaries at the Inaugural Ceremony

Hon'ble MPs Shri Ram Tahal Choudhary and Shri Raghunath Jha and Shri Ramesh Singh Munda, MLA emphasised the importance of lac, especially, for the tribal growers of Chhotanagpur region. They called for boosting the production of lac and promotion of industries, based on lac. They also lauded the services rendered by the institute for the development of lac, during the past seventy-five years. The message from Hon'ble Minister of State, Shri Sawna Lakra, was also read out who could not attend the inaugural ceremony, due to physical indisposition. He appealed for the protection of the interest of tribal growers and creating a favourable environment for improved utilization of lac.

Hon'ble Agricultural Minister, Shri Nitish Kumar lauded the contribution made by ILRI for the development of lac. He stressed on the importance of lac in the economy of tribals and called promotion of lac cultivation in newer areas. He wanted to ensure that the grower gets the right price for his produce. He appealed for enhancing the domestic consumption of lac and also for strengthening the export of the commodity. He assured the industry that if there is undue taxation on lac trade he would take suitable initiative. He also asked the scientific community to develop the Institute into an International Centre of Excellence. He hoped that lac will also form a component of the "Rainbow Revolution" of the country.

Dr Anwar Alam, DDG (Engg.), delivering his Presidential address congratulated the past and present workers of the institute for the achievements of the insitute, during the past seventy-five years. He traced the historical development of lac trade in the country. He

discussed about the various factors affecting the lac industry and stressed on the use of modern technologies to achieve better quality and price to compete in the world market. He cautioned about the competition from other countries producing lac and sought for taking advantage of our strengths to assume a much greater role in lac trade globally, than at present. A number of publications were released the Inaugural ceremony of the Symposium. They were :

- Platinum Jubilee Souvenir
- 1 Book, 6 folders, 1 bulletin and 6 promotional posters.

The technical sessions were broadly divided into oral and poster sessions. Papers on all the theme areas were divided among these two sessions. There were following three technical sessions under each category:

- Lac culture, tribal upliftment and eco-system development
- Value addition, process upgradation, product diversification
- Transfer of Technology, Bottlenecks in lac consumption and means of overcoming them; quality management

The presentation of papers in each session was preceded by invited lectures from experts in the field.

The recommendations emerging from these sessions were discussed in the Valedictory session to draw out list of recommendations which has been presented below :

- A policy paper should be brought out taking a holistic view of lac scenario, covering lac growers, production, industries, trade and export, etc.

Action: ILRI

- Lac crop insurance scheme should be introduced to overcome the adverse effect of crop failure in the farmers' field and lac crop production, in general

Action: Insurance agencies & Financial institutions

- Agricultural tax on lac should be abolished and inter-state restriction on movement of lac should be removed

Action: State Govts.

- Quality of the processed lac and price should be maintained in order to minimise their adverse impact on demand

Action: Lac industry

- In view of the promising results obtained for utilisation water soluble lac in the field of sericulture, its production on industrial scale should be taken up

Action: Lac Processing Units & Entrepreneurs

- Large scale Broodlac distribution programme should be taken up to augment lac production and for quick recovery of lac production, after major crop failure

Action: TRIFED, SEPC, BISCOLAMF & NGOs

- Concerted efforts should be made for increasing the production of lac

Action: IFP, TRIFED, SEPC, ILRI, GOs & NGOs

- Wide publicity should be given for the technologies developed at ILRI for fine chemicals and other products derived from lac

Action: ILRI

- Farmers living adjacent to lac producing forest regions should be allowed to exploit the host trees freely for lac production

Action: Forest Department

- Rural women should be trained in lac cultivation to encourage their greater participation

Action: GOs, NGOs & ILRI

- Collection of lac production data should be strengthened and improved to obtain a more reliable estimate of lac production

Action: IFP

- Collection of traditional knowledge on me-

dicinal uses of lac and investigation of specific pharmaceutical potential should be taken up.

Action: ILRI and other research institutes.

- Biotechnology laboratory should be established at ILRI for taking up genomic analysis, transgenic experiments on lac insects and their hosts.

Action: Research Institutes; Industry

- A number of R&D areas were identified which need greater emphasis. They included collection and conservation of lac insects and hosts, bio-intensive IPM approaches, lac-host nutrient management, insect-host relationship, mixed cropping and integration of tasar and lac culture

Action: ILRI, NIRJAFT, CTR&TI, Central Sericultural Research Institute

- ILRI should take up collaborative Research Project with NIRJAFT for making particle board/composites

Action: ILRI, NIRJAFT

- Research-industry interaction should be strengthened

Action: ILRI

- ILRI should reach lac growers through lac industrial houses to promote lac cultivation

Action: ILRI, Lac Processing Units

- Awareness programme should be launched for development of cottage and SSI units for increasing the consumption of shellac

Action: ILRI, Extension agencies

- A mechanism should be developed to assess the impact of the technologies transferred

Action: ILRI

- ILRI Newsletter should publish data related to lac production, price & export

Action: ILRI

DISTINGUISHED VISITORS

Museum

The lac museum at the Institute was visited by 387 persons from all walks of life. Besides, about 680 farmers, sponsored by various GOs and NGOs, as well as students also visited the museum.

The following were some of the distinguished visitors who visited the museum during the period under report:

- Dr. Mangla Rai, D.D.G. (C.S) ICAR, New Delhi.
- Brig. S. C. Malik, Chief Engineer.
- Else Marie Storagaard Fog, Handicraft designer & manufacturer Denmark.



Mr. Chasari and Mrs. Apinya Satchahard, Thailand



Mr. Janjibhai Patel, Forest Minister, Gujarat

- Mr. K. R. Lee, Mr. Y. H. Kim and Mr. H. T. Park Seoul, Korea.
- Mr. Shyam Vidyarthi, Doordarshan Kendra, Ranchi
- Dr. S. K. Arora, QRT Member (ICAR), Former Dean C.C.S.H., Agra University
- Mr. Chasari and Mrs. Apinya Satchahard, Thailand
- Mr. Janjibhai Patel, Forest Minister, Gujarat.
- Prof. S. Prasad, IIT, Kharagpur.
- Mr. Nitish Kumar, Union Minister for Agriculture, Govt. of India.
- Dr. P. Parvatta Reddy, Director, I.I.H.R., Bangalore.



*Dr. K. K. Kumar,
Director explaining
Hon'ble Union Agric.
Minister at the
Museum*

PERSONNEL

(As on 31.12.2000)*

Name	Designation
Dr. K. K. Kumar	Director
Division of Lac Production	
Dr. P. Kumar	Principal Scientist & Head of the Division
Division of Lac Processing and Product Development	
Dr. P. C. Gupta	Principal Scientist & Head of the Division
Division of Transfer of Technology	
Dr. K. K. Kumar	Head of the Division
R.F.R.S, Dharamjaigarh, M.P.	
Dr. S. K. Jaipurkar	Senior Scientist (Agric. Entomol.) I/c
R.F.R.S., Balarampur, W.B.	
Dr. A Bhattacharya	Senior Scientist (Agric. Entomol.) I/c
Administrative Section	
Sri A. Rastogi	Administrative Officer
Sri R. K. Singh	Finance & Accounts Officer
Director's Cell	
Dr P.C. Sarkar	Scientist
Library	
Sri R. P. Tewari	Technical Officer (T-5)
Quality Control (Testing Lab.)	
Sri D. Ghosh	Technical Officer (T-5) Lab.
Farm Unit	
Dr. B. P. Singh	Senior Scientist (Agronomy), I/c
Maintenance and Workshop Unit	
Sri S. K. Srivastava	Technical Officer (T-5)
Hindi Cell	
Sri Lakshmi Kant	Asstt. Director (O. L.)
Medical Unit	
Dr. N. P. Sahu, M.D.	Authorised Medical Attendant (Part-time)

* See Appendix II for details.

SUPPORT SERVICES

Farm

During the period under report, the following activities were undertaken:

Management and maintenance of Farm Plantation including roads, paths, channels, hedges etc. were carried out. Hoeing, weeding, mulching of various plots, termites from lac host trees, and maintenance of various plots and roads were carried out wherever and whenever necessary. Unwanted and obnoxious weeds were eradicated from *ber*, *khair*, *kusum*, *putri*, *palas*, *sisam*, *akashmani* plots manually as well as through ploughing frequently. Pruning of *khair*, *galwang*, *akashmani*, *kusum* was also done as per requirement. Seedlings of various host plants viz., *kusum*, *ber*, *galwang*, *palas*, *akashmani*, *khair* and *bhalia* were raised in polythene bags as well as in nursery beds for filling up of the vacant spaces in respective plots for research experiments and for distribution among the farmers. At the onset of monsoon, seedlings of different lac hosts were transplanted in respective plots and new plantation was raised in plot nos. 64, 65. After monsoon, application of lime to lac host plants in the farm and avenue trees in the Institute campus was also carried out.

For beautification of the office premises, seasonal flowers, shrubs and ornamental foliage plants were planted at suitable areas sites.

Inter-space and waste land utilisation

Crops of paddy CVs, viz., Mansuri, IR 36, Basmati 1310 and Gora paddy were raised in unutilized areas of farm and satisfactory yields were obtained. Soyabean, turmeric and ginger were raised in *kusum* plantation for utilization of inter space. Gora paddy and ragi were also raised in upland area of farm and satisfactory yields were obtained. Seedlings of *kusum*, *ber*, *palas*, *khair*, *akashmani*, *galwang* were planted in their respective plots to fill up the gaps. More than 1000 trainees/farmers/students visited the Institute Plantation under short and long term training programmes organised by the TOT

Division. Proper arrangements were made to acquaint them with lac insect, host plants and improved methods of lac cultivation. Total return from the farm produce sale was about Rs. 53,300.



Intercropping in kusum plot

Testing Lab

During the period, 96 samples of shellac, seedlac, bleached lac, lac dye and aleuritic acid received from different Govt. organisations, private industries and various divisions of ILRI were analysed. Altogether 208 tests were carried out. Besides, 3 ARS scientists of LP & PD Division were also provided training on the analysis and various testing of lac. Approximately Rs 8,690 was collected as testing charges.

Director's Cell

The Cell continued to provide services for the research activities of the Institute. Meetings of the Research Advisory Committee and Staff Research Council were convened for reviewing the progress of ongoing research projects and to examine the new research projects to be undertaken. Research Project Files for ongoing projects were maintained. Assistance in day to day technical correspondence was provided to the Director of the Institute.

Materials for various technical reports including, monthly report for the Cabinet, quarterly report on Annual Action Plan, DARE report and Research highlights of ICAR were

collected and compiled for onward transmission to the Council. Information on various matters/activities related with the Institute, including audit queries was also supplied. The Cell also processed the research papers submitted for forwardal to scientific and popular journals. A monthly Senior Officials meeting (SOM) of the institute was also initiated by the Cell from October 2000.

ARIS Cell

The ARIS Cell provided the following services during the period under report :

- Network Administration through one LINUX - based server and one Windows NT server.
- Photocopying facilities
- Scanning facilities for creating image files
- Word processing facilities for Director's Cell, Quality Control (Testing) Lab, etc.
- Supervision of computer related jobs of institute, particularly software-related problems.
- Providing internet browsing and e-mail facilities to several nodes through KU Band FTDMA VSAT.
- Maintaining liaison with NIC, CMC, CET (SAIL) etc.
- Assistance in preparation of Power Point presentation for seminars, meetings etc.

First phase of creating of institute website was completed and domain name registration www. ilri. net was also done.

Library & Documentation Centre

The Library of the Institute acts as a repository for Scientific and Technological information on lac. Besides catering to the needs of Institute's scientists and technologists, the library also renders services to other researchers, academicians, students and lac industrialists from all parts of the country e.g., BIT, Mesra; Ranchi University; Vinobha Bhave University, Hazaribagh; RIT, Jamshedpur; IIT, Kharagpur etc. The Library also maintains appropriate linkages with leading libraries e.g., National Library, Kolkata; INSDOC, New Delhi; American Centre Library, New Delhi and INSA

Library for strengthening the information resources. This Library also supplies photocopies of rare research articles to National Science Library, New Delhi.

Seven CD-ROM Discs of AGRIS databases (1975-2000) and Internet-based "Current Contents - Life Sciences, Agriculture and Biology" have been acquired from NATP funds. Renovation of Library furniture has also been proposed during the year under report. Purchase of three additional Computers is being finalised.

Library holdings (as on 31st March, 2001)

Documents	Additions during the Year under report	Total Holdings
Books	35	7069
Bound Journals	417	17099
Annual Reports	165	3860
Reprints/Photocopies	5	305
Bulletins/Research	7	518
CD-ROMs	19	36
BIS-specifications	3	93
Patents		
(a) Foreign	-	327
(b) Indian	-	15

Subscriptions & Receipts

Periodicals	Subscribed	Gratis/Exchange
Foreign	28	20
Indian	61	41

The Library also maintains the consolidated mailing lists as detailed below for regular supply of the Annual Report/News letters & other Publications of the Institute :

	No. of organisations
Indian	
Exchange (for Libraries)	48
Complimentary	69
NGOs & others	104
Foreign Countries	
Exchange	6
Complimentary	9
Embassies & others	7

The Library has provided the following services to its users during the years :

Reprography: Photocopies of 2500 pages : have been produced and supplied to the readers on payment and 3850 pages of photocopies have also been provided for in-house readers, free of cost.

Circulation : 875 Books and Journals were issued to the users of the Library.

Sale of Institute Publications : Sale of various institute publications (priced & unpriced) is also being looked after by the library section. 132 Nos. of priced publications were sold and 4000 Nos. of unpriced publications have been issued for distribution. A revenue of Rs. 3500/- has been earned during the year under report. Free mailing of the Institute publications to various dignitaries of the Council and other Govt./Semi-Govt./PSUs/NGOs/Industry people/ Farmers has also been performed against requests.

Lamination : Lamination facility has been provided for official purpose. Lamination of the covers of DTP documents produced by the Institute has also been done.

Downloading of Web-based Scientific journals : This facility has also been extended (upon request) for the bonafide staff of this Institute.

Mechanical Section

The Section undertakes electrical maintenance work of entire office, laboratory buildings, residential quarters, street lights, pump houses (situated about 2.5 km away from the Institute), HT/LT sub-stations and also electric supply through generator set.

The Section maintains liaison with State Electricity Board for maintenance of 11 kVA feeder and certification/settlement of HT/LT energy bills/fuel surcharges etc. It undertakes monthly record of electricity consumption and billing for residential quarters. It undertakes jobs for minor repair of instruments and equipments. This unit maintains water pipe line from pumping station, situated about 2.5 km

away from the institute at Swarnrekha river bed site, to the Institute and also the pipe line within various establishments and residential quarters of the Institute.

Besides, a Pedal Operated Lac Scraper and tree pruners were fabricated under the project entitled "Mechanisation of Lac Cultivation Operation". The fabrication of mechanical *bhatta* (furnace) for making shellac and button lac is under progress in the section under the supervision of PD Unit.

Different jobs undertaken by the Section are given below :

Description	No. of jobs carried out
• Electrical maintenance of office campus, including street lights etc.	482
• Electrical residential	256
• Instrument/equipmnt repair	351
• Repair/overhauling work for engines, pumps, motors and other small machines	295
• Machine shop (lathe, drilling, grinding and fabrication) work	315
• Electrical welding, M.S. fabrication, repair of farm equipments	254
• Civil Maintenance Laying/repair of water pipe line for residential quarters and office carpentry work viz., repair/fabrication of doors, windows, furnitures and related to research work	350
• Other Activities Monitoring of maintenance work for generator sets	

Health Care

Medical needs of the staff members and their dependants are taken care of by the Institute. A part-time Authorised Medical Attendant visits the Institute Dispensary on all working days. Assistance is given by one Stockman-cum-Compounder and an attendant. During the period, 6520 consultations were made of the staff members and their wards. Besides, 115 cases were referred to different specialists at RMCH and other authorised hospitals.

कार्यकारी सारांश

लाख के अनुसंधान एवं विकास कार्य में पूर्णरूप से संलग्न भारतीय लाख अनुसंधान संस्थान एक अग्रणी संस्थान है। रिपोर्ट की अवधि में संस्थान ने अपनी स्थापना की प्लैटिनम जुबली मनाई है। श्री नीतीश कुमार, माननीय केन्द्रीय कृषि मंत्री, डॉ. अनवर आलम, उप महानिदेशक (अभियान्त्रिकी) भा.कृ.अनु.प. समेत कई अन्य गणमान्य लोगों ने इस समारोह में भाग लिया।

पिछले पचहत्तर वर्षों से राष्ट्र की सेवा में समर्पित इस संस्थान ने लाख उत्पादन, परिपालक पौधों का प्रबंधन, लाख प्रसंस्करण, मूल्य संवर्धन एवं लाख के उपयोग में विस्तार जैसे क्षेत्रों में संस्थान ने कई प्रौद्योगिकी विकसित की है। संस्थान लाख कृषकों, लाख आधारित उद्योगों की समस्याओं एवं जरूरतों के निदान के लिए प्रयत्नशील रहती है तथा लाख के उत्पादन एवं इसके उपयोग को बढ़ाने के अनुसंधान संबंधी सहायता उपलब्ध कराती है।

अनुसंधान

संस्थान की अनुसंधान परियोजनाएं मुख्यतः चार कोर कार्यक्रमों के अन्तर्गत अनुसंधान संबंधी दो विभाग, लाख उत्पादन विभाग तथा लाख प्रसंस्करण एवं उत्पाद विकास विभाग के द्वारा आयोजित की जाती है। रिपोर्ट की अवधि में संस्थान द्वारा की गई अनुसंधान संबंधी उपलब्धियों का सारांश निम्नवत है :-

लाख उत्पादन

- अक्टूबर में टर्सियरी प्ररोह के हटाने एवं अप्रैल मई में पानी के छिड़काव से गर्मी के दौरान बेर पर कुसमी लाख फसल के उत्तरजिवीता में वृद्धि देखी गई
- संचारण के तीसरे, चौथे, नौवे एवं दसवें सप्ताह के बाद पलास के प्रत्येक वृक्ष पर 50, 75 एवं 100 कीट की दर से ट्राइकोग्रामा चिलोनिस तथा भालिया की प्रत्येक झाड़ी पर 10, 15 एवं 20 कीट की दर से टी. प्रेटीओसम के छोड़े जाने पर यूब्लीमा एमाविलिस (50-84%) एवं स्यूडोहाइपाटोपा पल्वेरिया (57-91%) परभक्षियों की संख्या में काफी कमी पाई गई। लाख युक्त पलास वृक्ष पर टी. चिलोनिस के 100 कीट छोड़े जाने से नियन्त्रण (कन्ट्रोल) की तुलना में 239% ज्यादा बीहन लाख की प्राप्ति हुई।
- इन्डोसल्फान (62.5 पीपीएम) एवं इथोफेन प्रौक्स (100, 50 एवं 25 पीपीएम) में ई. एमोविलिस के अण्डे को डुबाने पर उनमें शत प्रतिशत मरणशीलता देखी गई जबकि फिल्ड

स्थितियों में इथोफेनप्रौक्स (0.005 से 0.02% की दर से) से ई. एमोविलिस लार्वा में उल्लेखनीय मरणशीलता देखी गई।

- जाड़े की लाख फसल (अगहनी 2000-01) के लाख संचारण के पूर्व एफ. सेमिएलाटा की तुलना में एफ. मैक्रोफाइला में वृद्धि संबंधी प्रायः सभी लक्षणों का मान अधिक पाया गया। एफ. मैक्रोफाइला में 80 डीएसी (गुल्मवन कटाई के बाद के दिन) में पौधों की लम्बाई में वृद्धि की दर 0.51 एवं 2.20 से.मी./दिन थी तथा एफ. सेमिएलाटा में 80-150 डीएसी में 0.24 एवं 1.20 से.मी. वृद्धि देखी गई। उसी प्रकार नीचे के घेरे में एफ. मैक्रोफाइला में 80 डीएसी में 0.026 एवं 0.020 से.मी./दिन तथा एफ. सेमिएलाटा में 80-150 डीएसी में 0.013 से.मी./दिन वृद्धि दर देखी गई। अन्तर फसल के रूप में दूसरी सब्जियों की तुलना में फ्रेंचबीन का उत्पादन बेहतर रहा।
- सहसम्बन्ध एवं रिग्रेशन विश्लेषणों द्वारा जाड़े की कुसमी लाख (अगहनी 1999-2000) में आकाशमणि (एकेशिया ऑरीकुलीफॉर्मिस) के बीहन लाख, यष्टिलाख एवं बायोमास की उपज के लिए एक प्रेडिक्शन मॉडल विकसित किया गया है। जाड़े के समय लाख की फसल में टहनियों पर लाख की परत का मोटा घेरा 3.38-2.37 से.मी. पाया गया।
- अण्ड परजीवी के छोड़े जाने पर नियन्त्रण की स्थिति में दोनों परजीवी यूब्लीमा एमाविलिस एवं स्यूडोहाइपाटोपा पल्वेरिया की संख्या में क्रमशः 50-75% तथा 57-83% की उल्लेखनीय कमी देखी गई। पलास पर कतकी फसल के लिए प्रति वृक्ष 100 परजीवी छोड़ा जाना सर्वाधिक उपयुक्त पाया गया।
- प्रयोगशाला के अन्दर कृत्रिम भोजन खिलाने पर एक्टोपारासीटायड ब्रेकन हेक्टर, स्यूडोहाइपाटोपा पल्वेरिया के लार्वा को 58% तक परजीविता प्रदान करता है।
- ब्रेकन हेक्टर परजीवी के उपर डिक्लोरवोस (0.03%) तथा इथोफेन प्रौक्स (0.01%) कीटनाशी का कोई विपरीत प्रभाव नहीं पड़ता है, जबकि इन्डोसल्फान (0.05%) का प्रयोग बहुत हानिकारक रहा तथा प्रयोग के 24 घण्टे के अन्दर ही 100% मरणशीलता देखी गई।
- संचारित प्ररोह/झाड़ी की संख्या एवं लम्बाई की दृष्टि से फ्लेमजिया स्ट्रीकटा का प्रदर्शन बहुत अच्छा रहा क्रमशः 91% एवं 57% वार्षिक गुण तथा 16.8% एवं 6.3% अनुवार्षिक विकास देखा गया।

- राँची की जलवायु में आने के बाद से ट्राइवोल्टाइज किरमिजी लाख कीट की पिछली ग्यारह पीढ़ियों के जीवन चक्र में परिवर्तन का लक्षण देखा गया।
- बंगलोर (कर्नाटक), त्रिसुर (केरल), अजमेर (राजस्थान) एवं अमसोई (नवगाँव, असम) से लाए गए लाख कीटों से वर्तमान कीट जीवद्रव्य में वृद्धि हुई तथा उसका फ्लेमेंजिया मैक्रोफायला पर गमले में रख-रखाव किया जा रहा है। अमसोई (असम), चित्रदुर्गा (कर्नाटक) एवं पालकाड (केरल) से संग्रह किये गए लाख कीट में यूब्लीमा एमाविलीस परभक्षी का काफी ग्रसन देखा गया।
- लगभग 06 कि.ग्रा. यष्टि लाख के 95% तक छिलाई की क्षमता वाला एक रौलर की तरह का लाख छिलने की मशीन अभिकल्पित कर बनाई गई।

लाख प्रसंस्करण एवं उत्पाद विकास

- (जेड)-9 हेक्साडेकेन-1 अल, लिंग फीरोमोन यौगिक का थ्रिओ-एल्यूरीटीक अम्ल से विश्लेषण किया गया। इसको (जेड)-11-हेक्साडेकेन-1-अल के साथ मिश्रित कर हल्कोपर्वा आर्मीगेरा पर मूल्यांकन किया गया। इसने तीन दिनों में एच. आर्मीगेरा के 23 वयस्कों की पहचान की।
- एल्यूरीटीक अम्ल से 1, 9 नोनेन डायोल डायेसीटेट नामक एक मच्छर भगाने / मारने वाली दवा विश्लेषित की गई। इसकी भगाने / मारने की क्षमता का परीक्षण किया जा रहा है।
- एल्यूरीटीक अम्ल से (इ)-2 आनेडेसेन-1, 11-डायोल डायेसीटेट का विश्लेषण किया गया। इस यौगिक में मच्छर भगाने / मारने की क्षमता होने की संभावना है।
- ताप एवं जलरोधी चपड़ा वार्निश, दो चपड़ा आधारित टीन कैन लैकर एवं एक गर्म पिघला आसंजक मिश्रण तैयार किया गया।
- गमी मास एवं कृत्रिम रेजीन के मिश्रण से तथा पिघलाकर मिलाने से तैयार किये गए भर्जित तरह के विद्युतरोधी वार्निश के वैद्युतीय गुणों का अध्ययन किया गया। हवा में तथा 24 घण्टे पानी में डूबाने के बाद दोनों स्थितियों में परीक्षण करने पर पता चला कि वार्निश की फिल्म में उच्च परावैद्युत शक्ति है तथा ट्रांसफॉर्मर तेल तथा प्रतिरेखन रोधी होने के अतिरिक्त 240°सी तक तापरोधी क्षमता भी देखी गई।
- फल और सब्जियों के संरक्षण लेपन के रूप में प्रयोग के लिए लाख मोम पर आधारित कुछ इमल्सन सूत्रण एवं विरंजित लाख तैयार किया गया। लाख मोम एवं अन्य तत्वों पर आधारित बहुपयोगी पॉलिस मिश्रण बनाने के प्रयास किये जा रहे हैं।

- त्रीस्तरीय चटाई निर्माण तकनीक द्वारा लाख फैक्टरी के लकड़ी वाले अनुपयोगी सामग्री का उपयोग कर चिकने सतह का पार्टिकिल बोर्ड सफलतापूर्वक बनाया गया। इसके बाद यह पाया गया कि पार्टिकिल बोर्ड के निर्माण में फेनॉल फॉर्मलडिहाइड रेजीन एवं एल्यूरीटीक अम्ल - मुक्त गमी मास के मिश्रण का उपयोग किया जा सकता है।
- आई.एस. 10026-1982 के मानदण्डों के अनुरूप चपड़ा एवं दो/तीन कृत्रिम रेजीनों पर आधारित विद्युतरोधी वार्निश के कई मिश्रणों के विद्युतीय एवं अन्य गुणों का अध्ययन किया गया। ये वार्निश परावैद्युत शक्ति, प्रतिरेखनरोध तथा ट्रांसफॉर्मर तेल जैसी वांछित लक्षणों के अनुरूप हैं। इस वार्निश की फिल्म लचीली है तथा 240°सी तक ताप रोधी क्षमता रखती है। 6.6 केवी 750 के.डब्ल्यू. एवं 3.3 केवी 400 एच.पी. विद्युत मोटरो पर इन वार्निशों का प्रयोग करने पर दो वार्निश संतोषजनक पाए गए।

प्रौद्योगिकी हस्तांतरण

प्रौद्योगिकी हस्तांतरण विभाग ने कृषकों, छात्रों, प्रशिक्षणार्थियों, परीवीक्षा अधिकारियों एवं उद्यमियों के लिये लाख के विभिन्न पहलुओं पर कई प्रशिक्षण कार्यक्रम आयोजित किये गए जिनका संक्षिप्त विवरण निम्नवत है:

- लाख की खेती एवं इससे जुड़े पहलुओं पर उन्यासी (79) किसानों (आठ बैच) को एक सप्ताह का प्रशिक्षण दिया गया। बनारस हिन्दु विश्वविद्यालय के स्नातक विज्ञान (कृषि) के 22 छात्रों के एक बैच को लाख पर एक सप्ताह का विशेष प्रशिक्षण दिया गया।
- झारखण्ड, छत्तीसगढ़ एवं उड़ीसा में परिसर के अन्दर एवं क्षेत्र में आयोजित कई प्रशिक्षण कार्यक्रमों में 800 से अधिक किसानों ने भाग लिया।
- 19 बैचों में 482 किसानों तथा 102 छात्रों के लिए लाख पर एक दिन का अभिविन्यास कार्यक्रम भी चलाया गया।
- उद्यमिता विकास संस्थान बिहार द्वारा प्रायोजित 25 प्रशिक्षणार्थियों के एक बैच को कुछ चुने हुए लाख आधारित उद्योगों का प्रशिक्षण दिया गया।
- लाख डाई की तकनीक एक उद्यमी को हस्तांतरित की गई।
- विदेशी बाजार में अपनी पहुँच बढ़ाने के लिए हाल में विकसित विद्युतरोधी वार्निश की प्रौद्योगिकी के हस्तांतरण हेतु भा.ला.अनु.सं. द्वारा दो निजी एजेंसियों सर्वश्री तजना शैलेक प्राइवेट लिमिटेड, खुंटी एवं इनकॉन, राँची के साथ समझौता ज्ञापन पर हस्ताक्षर किये गए।

प्रचार

- संस्थान में विकसित लाख प्रौद्योगिकी एवं लाख को बढ़ावा देने के उद्देश्य से संस्थान ने बारह प्रदर्शनियों/ किसान मेलों में भाग लिया।
- ग्यारह प्रकाशन एवं छः प्रचार संबंधी पोस्टर निकाले गए। त्रैमासिक प्रकाशन आई.एल.आर.आई. न्यूजलेटर नियमित रूप से निकाले गए। हमारे प्रचार साहित्य बड़ी संख्या में पुनर्मुद्रित किये गए तथा विभिन्न अवसरों पर बाँटे गए।

प्रसार अनुसंधान

- प. बंगाल, छत्तीसगढ़ एवं महाराष्ट्र की कुछ लाख प्रसंस्करण ईकाइयों का वर्तमान स्थिति एवं समस्याओं का सर्वे द्वारा आकलन किया गया।
- झारखंड, प. बंगाल एवं उड़ीसा के लाख उत्पादक क्षेत्रों में लाख की खेती से सम्बन्धित आंकड़े इकट्ठा करने के लिए सर्वे किया गया।

राष्ट्रीय संगोष्ठी का आयोजन

संस्थान की स्थापना की प्लैटिनम जुबली के अवसर पर "नई सहस्राब्दी में लाख" विषय पर दो दिन की एक राष्ट्रीय संगोष्ठी आयोजित की गई। एक भव्य समारोह में इसका उद्घाटन श्री नीतीश कुमार, माननीय केन्द्रीय कृषि मंत्री ने किया। इस अवसर पर कई प्रकाशनों का विमोचन किया गया। इसमें लगभग 140 प्रतिभागियों ने भाग लिया।

मानव संसाधन विकास

निम्नलिखित वैज्ञानिकों को 01 सितम्बर 2000 से 30 मार्च 2001 तक राष्ट्रीय कृषि अनुसंधान प्रबंध अकादमी, हैदराबाद में कृषि अनुसंधान सेवा (72वें एफ.ओ.सी.ए.आर.एस.) के 72 वें आधार पाठ्यक्रम के लिए प्रतिनियुक्त किया गया।

- श्री सरोज कुमार गिरि (ए.एस.पी.ई.)
- श्री सन्तोष कुमार सिंह यादव (कार्बनिक रसायन)
- श्री दीप नरारायण साहा (जैव प्रौद्योगिकी)
- श्री अरविन्द कुमार (एस.डब्ल्यू.सी.ई.)

तामिलनाडु कृषि विश्वविद्यालय, कोयम्बटूर के कीट विज्ञान विभाग द्वारा 14 नवम्बर से 13 दिसम्बर 2000 की अवधि में

"फसल कीटों के सूक्ष्म जैविक नियन्त्रण की बढ़ती प्रवृत्ति" विषय पर आयोजित विंटर स्कूल में डॉ. केवल कृष्ण शर्मा, वैज्ञानिक (वरीय वेतनमान) ने भाग लिया।

राष्ट्रीय कृषि अनुसंधान प्रबन्धन अकादमी, हैदराबाद द्वारा 04 अप्रैल 2000 से 15 अप्रैल 2000 की अवधि में "आंकड़ा विश्लेषण के लिए सांख्यिकी सॉफ्टवेयर" विषय पर आयोजित दो सप्ताह के प्रशिक्षण कार्यक्रम में डॉ. अनिल कुमार जायसवाल वैज्ञानिक (वरीय वेतनमान) ने भाग लिया।

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान, नई दिल्ली द्वारा 09 अक्टूबर 2000 से 21 अक्टूबर 2000 के दौरान "प्रोग्रामिंग एवं इन्टरनेट प्रौद्योगिकियाँ" विषय पर आयोजित दो सप्ताह के प्रशिक्षण कार्यक्रम में डॉ. पूर्ण चन्द्र सरकार, वैज्ञानिक ने भाग लिया।

आधारभूत संरचना विकास

एक बड़े क्षेत्र में तापमान एवं आर्द्रता बनाये रखने की क्षमता वाले एक मिस्ट प्रोपेगेशन चैम्बर का निर्माण किया गया। इसका उद्घाटन डॉ. आर. पी. काचरु, सहायक महानिदेशक (पीई) भा.कृ.अन.प. ने 07 अप्रैल 200 को किया।

प्रचार के उद्देश्य से प्रदर्शनी सामग्री, दृश्य श्रव्य सयंत्र, जेनेरेटर सेट इत्यादि ढोने के लिए एक विशेष रूप से डिजाईन किया गया एक प्रदर्शनी वैन क्रय किया गया।

संसाधन अर्जित करना

रिपोर्ट की अवधि में संस्थान ने प्रशिक्षण, विक्रय काउन्टर से उत्पादों की बिक्री इत्यादि से लगभग 2,17,000/- रु. के राजस्व की प्राप्ति हुई।

सम्मान

द जर्नल ऑफ इंस्टीट्यूशन ऑफ केमिस्ट्स (इंडिया) खंड 70-1998 में राँची विश्वविद्यालय के डॉ. ए. के. श्रीवास्तव, के साथ सह-लेखक के रूप में उनके फोरियर ट्रांसफॉर्म-इन्फ्रा-रेड स्पेट्रोस्कोपीक स्टडीज ऑन इस्ट्रीफिकेशन ऑफ लैक एवं "फोरियर ट्रांसफॉर्म-इन्फ्रस्टेड स्टडीज ऑन ब्लिचिक ऑफ शेलैक" शीर्षक पर प्रकाशित दो अनुसंधान पत्रों को सर्वोत्कृष्ट घोषित किए जाने पर डॉ. के. ए. ठक्कर (नकद) पुरस्कार रु. 1000.00 से संस्थान के लाख संसाधन एवं उत्पाद विकास विभाग के वैज्ञानिक डॉ. पूर्ण चन्द्र सरकार को सम्मानित किया गया।

परिचय

भारतीय लाख अनुसंधान संस्थान की स्थापना 1925 में हुई। भारत में लाख उद्योग की स्थिति की जाँच एवं इसके सर्वांगण विकास के लिए सुझाव देने हेतु 1920 के आरम्भ में तत्कालिन भारत सरकार द्वारा गठित श्री एच. ए. एफ. लिंडसे एवं श्री सी. एम. हालो की दो सदस्यीय समिति की अनुशंसा के फलस्वरूप इस संस्थान का प्रादूर्भाव हुआ। समिति की रिपोर्ट 1921 में प्रकाशित हुई। अन्य पहलुओं के अलावे उन्होंने लाख के लगातार उत्पादन के लिए वैज्ञानिक रूप से जाँची परखी विधि से सघन खेती की अनुशंसा की। उन सुझावों के आलोक में उस समय के लाख व्यापारी " भारतीय लाख अनुसंधान संगठन" नामक एक निजी पंजीकृत संस्था के अन्तर्गत संगठित हुए। इस संगठन को राज्य सरकार से भूमि प्राप्त हुई तथा संस्थापक निदेशक श्रीमती डोरोथी नॉरीस के अधीन संस्थान ने कार्य करना आरम्भ किया।

आरम्भ में कीट विज्ञान अनुभाग संस्थान की प्रमुख ईकाई थी तथा जैव रसायन अनुभाग उसकी सहयोगी थी। तत् पश्चात् 1920 के दशक में अनुप्रयुक्त अनुसंधान के लिए भौतिक रसायन अनुभाग बना। तदुपरान्त इन दोनों रसायन अनुभागों को मिलाकर एक रसायन विभाग बना। इस तरह इस संस्थान का कार्यक्षेत्र कीट वैज्ञानिक एवं रासायनिक दोनों पहलुओं तक विस्तारित हो गया।

1930 में राजकीय कृषि आयोग की अनुशंसा के आधार पर केन्द्रीय विधायिका द्वारा भारतीय लाख कर अधिनियम के अधीन भारत सरकार ने भारतीय लाख कर समिति का गठन किया, जिसने 1931 में संस्थान को "लाख संगठन" से अपने नियंत्रण में ले लिया। द्वितीय विश्वयुद्ध के बाद 1951 एवं 1956 में गठित प्रथम एवं द्वितीय समीक्षा समितियों ने मूल एवं अनुप्रयुक्त अनुसंधान पर समान रूप से बल देते हुए विस्तृत अनुसंधान कार्यक्रम बनाये। उस अवधि में क्षेत्रीय समस्याओं को दूर करने के लिए झालदा (प. बंगाल), दमोह, उमरिया (म.प्र.) एवं मिर्जापुर (उ. प्र.) में चार क्षेत्रीय अनुसंधान केन्द्र स्थापित किये गए। बाद में विभिन्न प्रकार के निर्मित लाख की गुणवत्ता नियंत्रण हेतु लाख निर्माताओं की सहायता के लिए क्षेत्रीय जाँच प्रयोगशाला भी स्थापित की गई। ये प्रयोगशालाएँ 1959 में झालदा (प. बंगाल) एवं गोन्दिया (महाराष्ट्र), 1961 में बलरामपुर (प. बंगाल) एवं डालटनगंज (बिहार) तथा 1962 में नामकुम (बिहार) में स्थापित की गई।

लाख कर समिति की समाप्ति के बाद 01 अप्रैल 1966 में भारतीय कृषि अनुसंधान परिषद् (भा.कृ.अनु.प.) ने संस्थान को अपने प्रशासकीय नियंत्रण में लिया। शेशाद्री समिति की अनुशंसा

के आधार पर दिसम्बर 1971 में संस्थान को रसायन विज्ञान, कीट विज्ञान, शस्य विज्ञान एवं पौध आनुवंशिकी, प्रौद्योगिकी तथा प्रसार पाँच विभागों में पुनर्गठित कर सुदृढ़ किया गया।

संस्थान

यह संस्थान राँची टाटानगर राष्ट्रीय राज पथ पर राँची शहर से 9 किलोमीटर पूरब शान्तिपूर्ण उपनगरीय क्षेत्र में स्थित है। यह स्थान समुद्र तल से लगभग 650 मी. ऊँचा तथा अक्षांश 23°23' उ. एवं देशान्तर 85°23' पूरब के बीच अवस्थित है। संस्थान की मिट्टी ग्रेनाइट जेनेसीस पर विकसित हुई है तथा बागान क्षेत्र की मिट्टी लैटेरिटीक तरह की है। नामकुम में प्रायोगिक बागान (लगभग 36.5 हे.) सहित संस्थान की कुल जमीन 49 हे. है। पारिस्थितिकी की दृष्टि से इस क्षेत्र में मध्यम स्वास्थ्य वर्द्धक जलवायु है तथा जनवरी से अगस्त के बीच औसत न्यूनतम मासिक तापक्रम 6.7° से 23.5° से. के बीच तथा औसत अधिकतम मासिक तापक्रम जनवरी से अप्रैल के बीच 25.1° से. से 40.1° से. के बीच रहा। इस अवधि में कुल वर्षा 1593 मी.मी. हुई जिसमें मानसून की वर्षा 1391 मी.मी. थी।

मुख्य परिसर में औषधालय एवं आवासीय क्वार्टरों के अतिरिक्त लाख उत्पादन विभाग, लाख संसाधन एवं उत्पाद विकास विभाग, प्रौद्योगिकी हस्तांतरण विभाग, प्रशासकीय अनुभाग, वित्त एवं लेखा अनुभाग, पुस्तकालय, निदेशक प्रकोष्ठ, कृषि अनुसंधान आसूचना तंत्र प्रकोष्ठ, राजभाषा प्रकोष्ठ एवं यांत्रिकी अनुभाग है। इससे सटे एक छोटा परिसर है जिसमें संसाधन प्रयोगशाला एवं स्टाफ के आवास गृह हैं। संस्थान के दोनों परिसरों में खेल का मैदान है।

वर्तमान स्थिति

सम्प्रति देश की खुली आर्थिक नीति, उद्योगों एवं कृषि उद्यमों की विश्वव्यापकता एवं भा.कृ.अनु.प. का संरचनात्मक एवं कार्यात्मक पुनर्गठन के मद्दे नजर संस्थान में भी संरचनात्मक परिवर्तन हुआ है एवं प्राथमिकताओं की पुनर्समीक्षा की गई है। पुराने विभागों/अनुभागों को समाप्त कर वैज्ञानिक क्षमताओं को लाख उत्पादन, लाख संसाधन एवं उत्पाद विकास तथा प्रौद्योगिकी हस्तांतरण नामक तीन विभागों में वितरण किया गया है। संस्थान द्वारा म.प्र. एवं प. बंगाल में दो क्षेत्रीय अनुसंधान केन्द्र चलाए जा रहे हैं। संस्थान से बाहर के प्रयोगों के लिए क्षेत्र एवं वृक्षों को दीर्घावधि लीज पर लिया गया है। भौतिक एवं मानवीय क्षमताओं की आधारभूत संरचना के व्यापक विकास की शुरुआत की गई है। संचार एवं सूचना की पुनः प्राप्ति हेतु सूचना भंडार तक

वैज्ञानिकों की पहुँच बनाने के लिए कृषि अनुसंधान आसूचना तंत्र प्रकोष्ठ (एरीस सेल) गठित की गई है।

अपने स्थापना काल से ही संस्थान ने लाख की खेती के वैज्ञानिक तरीकों से होने वाले लाभ के संबंध में आदिवासियों को जागरूक बनाने में महत्वपूर्ण भूमिका अदा की है। संस्थान समुचित प्रौद्योगिकी को बढ़ावा देने, विकसित करने तथा पृथक करने के लिए लगातार प्रयासरत है। संस्थान के पास लाख की खेती के वैज्ञानिक तरीके के लिए प्रौद्योगिकी उपलब्ध है और अनुरोध करने पर सभी प्रमुख लाख परिपालकों के लिए पैकेज एवं तरीकों की जानकारी दी जाती है। बिहार, प. बंगाल, उ.प्र., म.प्र. एवं उड़ीसा के लगभग 80,000 वर्ग कि.मी. क्षेत्र में कमजोर वर्गों के लाख के प्रमुख उत्पादकों के लिए संस्थान प्रौद्योगिकी का विस्तार करती है।

औद्योगिक पहलू की भी उपेक्षा नहीं की गई। संस्थान ने सतत अपनी वैज्ञानिक क्षमताओं को उपभोक्ता उद्योग की बदलती हुई मांगों के अनुरूप केन्द्रित किया है। कई उत्पाद एवं प्रक्रियाएं विकसित की गई हैं। पूर्व में इच्छुक लोगों के अनुरोध पर निःशुल्क प्रौद्योगिकी हस्तांतरित की जाती थी। संप्रति परिषद् द्वारा संसाधन की प्राप्ति हेतु निश्चित किये गए लक्ष्य प्राप्त करने के उद्देश्य से प्रौद्योगिकी हस्तांतरण के लिए मामूली शुल्क लिया जाता है। लाख की खेती एवं उपयोग के क्षेत्र में योगदान के लिए संस्थान को अन्तर्राष्ट्रीय मान्यता मिली है।

संस्थान के अधिदेश

मुख्य संस्थान के लिए :

- उपलब्ध या आनुवंशिक रूप से विकसित लाख कीट एवं लाख परिपालकों को अपना कर लाख की खेती की प्रौद्योगिकी विकसित करना।
- उद्योगों के लिए लाख संसाधन की तकनीक का विकास।
- पायलट संयंत्र प्रदर्शन हेतु लाख के उपयोग में विविधता लाने के लिए अनुसंधान।
- कृषकों एवं उद्यमियों के लिए प्रौद्योगिकी हस्तांतरण।
- लाख के उत्पादन, संसाधन एवं उपयोग पर सूचना संग्राहक के रूप में कार्य करना।

क्षेत्रीय अनुसंधान केन्द्रों के लिए

- भिन्न-भिन्न कृषि-जलवायु की परिस्थितियों के अन्तर्गत लाख की खेती की विकसित प्रौद्योगिकी की जाँच।
- बीहन लाख का उत्पादन एवं क्षेत्रीय परिपालकों की खोज।
- कृषि वानिकी पद्धति में लाख के उत्पादन को बढ़ाने हेतु कृषकों का प्रशिक्षण।
- क्षेत्रीय आधार पर उद्यमियों को जागरूक बनाने का कार्यक्रम।

संगठित ढांचा

संस्थान के प्रधान निदेशक है। वैज्ञानिक निम्नलिखित तीन विभागों में कार्यरत हैं: (1) लाख उत्पादन, (2) लाख संसाधन एवं उत्पाद विकास एवं (3) प्रौद्योगिकी हस्तांतरण। प्रशासनिक स्क्ंध में निदेशक कार्यालय, प्रशासकीय अनुभाग, क्रय अनुभाग, वित्त एवं लेखा अनुभाग एवं केन्द्रीय भंडार शामिल हैं। पुस्तकालय, निदेशक प्रकोष्ठ, प्रक्षेत्र अनुभाग एवं अनुरक्षण तथा कर्मशाला अनुभागों के द्वारा तकनीकी सहायता प्रदान की जाती है। राजभाषा प्रकोष्ठ, सुरक्षा, चिकित्सा एवं सम्पदा अनुरक्षण सेवाएं सहायक ईकाईयाँ हैं।

स्टाफ

संस्थान में 56 वैज्ञानिक, 84 तकनीकी, 43 प्रशासकीय एवं 112 सर्पोटिंग ग्रेड के स्वीकृत पद हैं।

राजस्व

रिपोर्ट की अवधि में संस्थान द्वारा विभिन्न मदों में की गई आय निम्नवत है।

शीर्ष	राजस्व (लाख में)
फार्म उत्पादों इत्यादि की ब्रिकी	2.16
जाँच शुल्क	0.09
सेवा प्रदान करने से प्राप्ति	3.08
आंतरिक योजनाओं से आय	1.01
प्रशिक्षण एवं परामर्शदात्री सेवा	1.87
अन्य प्राप्ति	1.60
कुल	9.81

बजट

2000-2001 की अवधि में योजना एवं गैर योजना मद में खर्च का विवरण नीचे सारिणी में दिया गया है।

लेखा शीर्ष	बजट अनुमान 2000-2001 (रु.लाख)	संशोधित अनुमान 2000-2001 (रु.लाख)	वास्तविक व्यय (रु.लाख)
योजना			
स्थापना शुल्क	-	-	-
मजदूरी	-	-	-
समयोपरि भत्ता	-	-	-
यात्रा भत्ता	3.00	2.80	2.80
निर्माण सहित अन्य शुल्क	53.00	55.20	48.54
निर्माण	10.00	7.00	6.01
कैच अप अनुदान			
उपकरण	15.00	11.00	9.97
निर्माण	25.00	19.00	17.88
पुस्तकालय की किताबें एवं अन्य मद	6.00	-	-
कुल	115.00	95.00	85.20 (90.00*)
योजनेत्तर			
स्थापना शुल्क	379.80	330.00	269.17
मजदूरी	-	-	-
समयोपरि भत्ता	0.05	0.05	0.05
यात्रा भत्ता	2.50	2.00	1.98
उपकरण समेत अन्य शुल्क	45.00	52.45	51.43
निर्माण	2.65	22.50	21.43
कुल	430.00	407.00	344.06 (385.00*)

* विमुक्त राशि

राजभाषा प्रकोष्ठ

भारत सरकार के राजभाषा विभाग (गृह मंत्रालय) द्वारा तैयार किए गए वार्षिक कार्यक्रम एवं राजभाषा अधिनियम एवं नियमों के संबंध में भारतीय कृषि अनुसंधान परिषद, नई दिल्ली से समय समय पर प्राप्त निर्देशों पर अनुवर्ती कार्रवाई तथा सरकारी कार्य में हिन्दी के अधिकाधिक प्रयोग को बढ़ावा देने तथा प्रोत्साहन योजना को लागू करने तथा हिन्दी को और गति प्रदान करने के लिए संस्थान तथा नगर स्तरीय हिन्दी की विभिन्न प्रतियोगिताओं को आयोजित करने के उद्देश्य से संस्थान में राजभाषा प्रकोष्ठ की स्थापना की गई है। इसमें एक सहायक निदेशक (राजभाषा) तथा एक हिन्दी अनुवादक के साथ साथ एक अंशकालिक चतुर्थवर्गीय कर्मचारी कार्यरत है।

संस्थान के दैनिक कार्य में हिन्दी के प्रयोग में प्रगति एवं इसे सर्वग्राह्य बनाने के उद्देश्य एवं बहुआयामी उपयोग के लिए राजभाषा प्रकोष्ठ द्वारा निम्नलिखित कार्य सम्पादित होते हैं :

- संस्थान राजभाषा कार्यान्वयन समिति की बैठकों का आयोजन, कार्यसूची एवं कार्यवृत्त की तैयारी तथा लिए गए निर्णयों पर अनुवर्ती कार्रवाई।
- वार्षिक रिपोर्ट का सारांश, कार्यालय आदेश, परिपत्र, ज्ञापन, निविदा सूचना एवं पत्राचार हेतु विभिन्न सामग्रियों का अनुवाद।
- हिन्दीतर अधिकारियों और कर्मचारियों को हिन्दी शिक्षण योजना द्वारा आयोजित प्रशिक्षण हेतु नामित करना।
- हिन्दी दिवस, हिन्दी सप्ताह, हिन्दी पखवाड़ा, हिन्दी मास एवं योजनानुसार अखिल भारतीय स्तर की राजभाषा गोष्ठी का आयोजन।
- संदर्भ साहित्य, हिन्दी पत्रिका, शब्दकोश एवं तकनीकी शब्दावली का उपार्जन।
- द्विभाषी मुहर, नामपट्ट एवं साइनबोर्डों के निर्माण में सहयोग।
- प्रचार सामग्रियों एवं विवरणिकाओं के प्रकाशन में भाषान्तरण में सहयोग।
- नगर राजभाषा कार्यान्वयन समिति की बैठकों में सहभागिता एवं समिति के निर्णयानुसार उनका कार्यान्वयन।
- तकनीकी शब्दावली का निर्माण एवं राजभाषा को समर्पित अन्य प्रकाशन की तैयारी। हिन्दी में वैज्ञानिक गोष्ठी के साथ साथ प्रशासनिक और तकनीकी वर्ग के लिए हिन्दी कार्यशाला का आयोजन।

उपरोक्त कार्यों के निष्पादन के लिए वर्ष 2000-2001 में निम्नलिखित सदस्यों की एक समिति कार्यरत रही।

डॉ. कौशल किशोर कुमार, निदेशक	- अध्यक्ष
डॉ. प्रेम चन्द्र गुप्ता, अध्यक्ष, लाख संसाधन एवं उत्पाद विकास विभाग	- सदस्य
डॉ. प्रणय कुमार, अध्यक्ष, लाख उत्पादन विभाग	- सदस्य
श्री रंगनादन रमणि, वरीय वैज्ञानिक एवं प्रभारी विभागाध्यक्ष, प्रौद्योगिकी हस्तांतरण विभाग	- सदस्य
श्री रजनीश कुमार सिंह वित्त व लेखा अधिकारी	- सदस्य
श्री अशिष रस्तोगी, प्रशासनिक अधिकारी	- सदस्य
श्री राम प्रताप तिवारी, पुस्तकालयाध्यक्ष	- सदस्य
डॉ. अंजेश कुमार, हिन्दी अनुवादक	- आमंत्रित सदस्य
श्री लक्ष्मी कान्त, सहायक निदेशक (राजभाषा)	- सदस्य सचिव

भारतीय कृषि अनुसंधान परिषद, नई दिल्ली के निदेशक (हिन्दी), श्री अनिल कुमार दुबे की अध्यक्षता में दिनांक 14.4.2000 की तथा संस्थान के निदेशक, डॉ. कौशल किशोर कुमार की अध्यक्षता में दिनांक 10.12.2000 की बैठक में निम्नलिखित निर्णय लिए गए

1. प्रशिक्षण सामग्री का हिन्दी में प्रकाशन
2. हिन्दी कार्यशालाओं का आयोजन
3. हिन्दी में कम्प्यूटर प्रशिक्षण
4. प्रेषण हेतु लिफाफों पर संस्थान का पता हिन्दी में मुद्रित करवाना।
5. हिन्दी में ई-मेल भेजने की सुविधा के लिए संस्थान के कम्प्यूटरों में ई-लिप साफ्टवेयर लगाना।
6. हिन्दी में पुनः चेक निर्गत किया जाना।

7. हिन्दी में गृह पत्रिका का प्रकाशन प्रारंभ करना।

अखिल भारतीय राजभाषा विचार गोष्ठी का आयोजन

नव सहस्राब्दि के राजभाषा स्वर्ण जयंती वर्ष में नगर राजभाषा कार्यान्वयन समिति के तत्वावधान में दिनांक 16.8.2000 को भारतीय लाख अनुसंधान संस्थान, नामकुम, राँची के संयोजन में निपट, हटिया, राँची में "कार्यालय की कार्य संस्कृति में सुधार" विषयक अखिल भारतीय राजभाषा विचार गोष्ठी का आयोजन किया गया। विचार गोष्ठी का उद्घाटन बिहार राज्य के महामहिम राज्यपाल, श्री विनोद चन्द्र पाण्डेय के कर कमलों से हुआ। समय की मांग के अनुरूप विचारगोष्ठी में चर्चा हेतु निम्नलिखित शीर्षकों का चयन किया गया।

1. बदलते परिवेश में कार्य संस्कृति
2. कार्य संस्कृति में सुधार हेतु नई तकनीक एवं तकनीकी विकास
3. अनुशासन, उत्पादकता एवं मानवीय प्रतिबद्धता का विकास

उपरोक्त तकनीकी सत्रों में अनुशासनहीनता, भ्रष्टाचार, कार्य के विलंब के घटक और दायित्व का अभाव जैसे विषयों पर चर्चा और उसके निराकरण हेतु विचार विमर्श किया गया।

राँची नगर राजभाषा कार्यान्वयन समिति के अध्यक्ष श्री लोकेश कुमार सिंघल ने वर्तमान परिस्थिति में कार्य पद्धति में कार्य संस्कृति में सुधार की आवश्यकता पर बल दिया तथा मुख्य आयकर आयुक्त श्री आशुतोष मुखोपाध्याय ने अपने-अपने दायित्व को बखूबी निभाने वाले अधिकारियों एवं कर्मचारियों की सराहना की। निपट के निदेशक डॉ. कमल किशोर ने कार्य निष्पादन में समयबद्धता की महत्ता पर प्रकाश डाला।

उपरोक्त तकनीकी सत्रों में आयकर आयुक्त, श्री श्यामाकान्त झा; दूरदर्शन केन्द्र, राँची के निदेशक श्री श्याम विद्यार्थी; आकाशवाणी की केन्द्र निदेशक श्रीमती रोजलिन लकड़ा; महाप्रबंधक, दूरसंचार, श्री नरेन्द्र कुमार भोई; केन्द्रीय तसर अनुसंधान एवं प्रशिक्षण केन्द्र, पिस्का, नगाड़ी के निदेशक डॉ. तंगावेलू; क्षेत्रीय रेशम अनुसंधान केन्द्र (केन्द्रीय रेशम बोर्ड) के संयुक्त निदेशक, श्री बी. एन. वाडियार एवं भारतीय विधिक माप विज्ञान संस्थान, काँके, राँची के निदेशक डॉ. दीनानाथ पाण्डेय एवं नगर राजभाषा कार्यान्वयन समिति के राजभाषा अधिकारी, डॉ. रमापति तिवारी ने सारगर्भित व्याख्यान से प्रतिभागियों को लाभान्वित किया।

इस अवसर पर स्मारिका का विमोचन बिहार राज्य के महामहिम राज्यपाल, श्री विनोद चन्द्र पाण्डेय के कर कमलों से हुआ जिसमें संस्थान के निदेशक, डॉ. कौशल किशोर कुमार, सहायक निदेशक (राजभाषा), श्री लक्ष्मीकान्त, वरीय वैज्ञानिक, श्री रंगनादन

रमणि, डॉ. केवल कृष्ण शर्मा, वित्त व लेखा अधिकारी श्री रजनीश कुमार सिंह, प्रशासनिक अधिकारी श्री अशिष रस्तोगी, पुस्तकालयाध्यक्ष श्री राम प्रताप तिवारी, तकनीकी अधिकारी श्री कवल किशोर प्रसाद एवं हिन्दी अनुवादक डॉ. अंजेश कुमार के उपरोक्त विषयों से संबंधित आलेख प्रकाशित हुए।

गोष्ठी के समापन सत्र का संचालन संस्थान के निदेशक, डॉ. कौशल किशोर कुमार तथा सहवाचन सहायक निदेशक (राजभाषा), श्री लक्ष्मी कान्त ने किया।

इस विचारगोष्ठी में बिहार, पश्चिम बंगाल, केरल, आंध्रप्रदेश एवं दिल्ली संघ राज्य के प्रतिनिधियों ने भाग लिया। तकनीकी सत्रों की अध्यक्षता, क्रमशः डॉ. दिनेश्वर प्रसाद एवं डॉ. सिद्धनाथ कुमार एवं सभा संचालन श्रीमती सुजाता कुमारी एवं श्रीमती ममता शर्मा ने किया।



विचार गोष्ठी का एक दृश्य, महामहिम राज्यपाल श्री विनोद चन्द्र पाण्डेय डॉ. लोकेश कुमार सिंहल, श्री आशुतोष मुखोपाध्याय एवं डॉ. कौशल किशोर कुमार (बाँये से दायें)

हिन्दी दिवस समारोह

संस्थान में 20 अक्टूबर 2000 को पारंपरिक हर्षोल्लास के साथ हिन्दी दिवस समारोह का आयोजन किया गया। इस अवसर पर मुख्य अतिथि के पद से बोलते हुए मेकन के पूर्व महाप्रबंधक एवं सचिव नगर राजभाषा कार्यान्वयन समिति श्री ओमेश्वर प्रसाद ने कहा कि हिन्दी की शिक्षा विद्यालय स्तर पर ही गहन रूप से दी जानी चाहिए ताकि आगे चलकर सरकारी कार्य हिन्दी में करने में किसी प्रकार की झिझक नहीं हो। उन्होंने प्रौद्योगिकी के क्षेत्र में हिन्दी के प्रयोग पर बल दिया और कहा कि तकनीकी कार्यों में इससे सृजनात्मक बल मिलेगा। संस्थान के निदेशक, डॉ. कौशल किशोर कुमार ने संस्थान में राजभाषा के प्रयोग संबंधी गौरवमय इतिहास को दुहराते हुए कहा कि 1930 से ही राजभाषा हिन्दी के साथ साथ अन्य क्षेत्रीय भाषाओं में पुस्तक, बुलेटिन एवं प्रचार पत्रिका का प्रकाशन होता रहा है। संस्थान को हिन्दी में उत्कृष्ट कार्य हेतु नगर राजभाषा कार्यान्वयन समिति द्वारा पुरस्कृत किया जा चुका



मुख्य अतिथि का स्वागत करते हुए डॉ. के.के. शर्मा, साथ में संस्थान के निदेशक

है। संस्थान के गोष्ठियों, कार्यशालाओं एवं बैठकों में हिन्दी का ही प्रयोग होता है। हिन्दी के प्रति श्रद्धा सुमन अर्पित करते हुए उन्होंने कहा कि हिन्दी हमारी मातृभाषा, राष्ट्रभाषा, संपर्कभाषा एवं राजभाषा है अतः इसका प्रचार प्रसार करना हमारा परम कर्तव्य है।

संस्थान के सहायक निदेशक (राजभाषा), श्री लक्ष्मी कान्त ने संस्थान की हिन्दी संबंधी गतिविधियों पर प्रकाश डालते हुए कहा कि प्रशासनिक कार्यों के साथ साथ वैज्ञानिक तथा तकनीकी कार्यों में भी हिन्दी का प्रयोग बढ़ा है। नगर स्तर पर हिन्दी के सराहनीय कार्य के कारण ही निदेशक, डॉ. कौशल किशोर को अखिल भारतीय राजभाषा विचारगोष्ठी के आयोजन हेतु आयोजक का कार्यभार सौंपा गया जिसका निर्वाह उन्होंने बखूबी किया।

संस्थान के विभिन्न विभागों/अनुभागों में कार्यरत अधिकारियों एवं कर्मचारियों को उनके विभागाध्यक्ष की अनुशंसा के आधार पर अपने विभाग/अनुभाग में हिन्दी में सर्वाधिक सराहनीय कार्य करने पर वरीय वैज्ञानिक डॉ. भरत प्रसाद सिंह, तथा डॉ. निरंजन प्रसाद, वैज्ञानिक (वरीय वेतनमान) श्री महेश्वर लाल भगत, प्रशासनिक अधिकारी श्री अशिष रस्तोगी, वित्त व लेखा अधिकारी श्री रजनीश कुमार सिंह, तकनीकी अधिकारी सर्वश्री राम प्रताप तिवारी, विनोद कुमार सिंह, अमर कुमार सहाय, संतोष कुमार श्रीवास्तव, रामानन्द वैद्य, तकनीकी सहायक, श्रीमती प्रभा देवी, सर्वश्री रमेश प्रसाद



मुख्य अतिथि द्वारा पुरस्कार वितरण

श्रीवास्तव, रामलोचन राम, हीरालाल भक्त, विनोद कुमार, राजकुमार राय, रविन्द्र कुमार रवि, सहायक सर्वश्री रजनी कान्त उपाध्याय, बसंत कुमार रजक, कनीय लिपिक श्री अर्जुन गोप को प्रमाण पत्र के साथ पुरस्कृत किया गया। सभा संचालन हिन्दी अनुवादक डॉ. अंजेश कुमार तथा धन्यवाद ज्ञापन वैज्ञानिक वरीय वेतनमान एवं समारोह के अध्यक्ष डॉ. केवल कृष्ण शर्मा ने किया।

हिन्दी में वैज्ञानिक गोष्ठी

वैज्ञानिक कार्यों में हिन्दी के प्रयोग को प्रोत्साहित करने के उद्देश्य से डॉ. दीपेन्द्र नाथ गोस्वामी, वरीय वैज्ञानिक ने दिनांक 24.6.2000 को "लाख आधारित विद्युत्तरोधी वार्निश में अद्यतन अनुसंधान" एवं डॉ. निरंजन प्रसाद, वरीय वैज्ञानिक ने दिनांक 24.2.2001 को "लाख मोम एवं इसकी संभावित उपयोगिताएँ" विषय पर रोचक एवं सारगर्भित व्याख्यान दिया।

उपरोक्त गोष्ठी में संस्थान के साथ-साथ केन्द्रीय बागवानी परीक्षण केन्द्र, राष्ट्रीय पादप आनुवंशिकी संसाधन ब्यूरो की स्थानीय इकाई के वैज्ञानिकों एवं तकनीकी अधिकारियों ने भाग लिया।

राँची नगर राजभाषा कार्यान्वयन समिति के बैठकों में सहभागिता

समय समय पर आयोजित राँची नगर राजभाषा कार्यान्वयन समिति के बैठकों में संस्थान के निम्नलिखित अधिकारियों एवं कर्मचारियों ने संस्थान का प्रतिनिधित्व किया :

बैठक की तिथि	संस्थान के प्रतिनिधियों का नाम
10.8.2001	निदेशक, डॉ. कौशल किशोर कुमार, सहायक निदेशक (राजभाषा) श्री लक्ष्मी कान्त, पुस्तकालयाध्यक्ष श्री रामप्रताप तिवारी, हिन्दी अनुवादक डॉ. अंजेश कुमार एवं वरीय लिपिक श्री प्रहलाद सिंह।
6.2.2001	विभागाध्यक्ष, सह प्रभारी निदेशक, डॉ. प्रणय कुमार, सहायक निदेशक (राजभाषा) श्री लक्ष्मी कान्त।

हिन्दी अन्ताक्षरी प्रतियोगिता का आयोजन

प्रत्येक वर्ष की भांति इस वर्ष भी राँची नगर राजभाषा कार्यान्वयन समिति के तत्वावधान में राँची स्थित केन्द्रीय सरकार के कार्यालयों के अधिकारियों एवं कर्मचारियों के लिए हिन्दी अन्ताक्षरी प्रतियोगिता का आयोजन दिनांक 7.8.2000 को संस्थान परिसर में किया गया उसमें केन्द्रीय तसर अनुसंधान एवं प्रशिक्षण केन्द्र, नगड़ी के डॉ. अश्विनी कुमार सिन्हा एवं भारतीय लाख अनुसंधान संस्थान के श्री राम प्रताप तिवारी एवं श्री प्रहलाद सिंह और दूरदर्शन केन्द्र के श्री संतोष कुमार तथा आर.डी.सी.एस. के श्री अनन्त कुमार पोद्दार को पुरस्कृत किया गया।



निबन्ध प्रतियोगिता में भाग लेते प्रतिभागी

राजभाषा विचारगोष्ठी में सहभागिता

मेकन, राँची के तत्वावधान में दिनांक 12 एवं 13 अप्रैल 2000 को आयोजित “21वीं सदी में प्रबंधन की चुनौतियाँ” विषयक

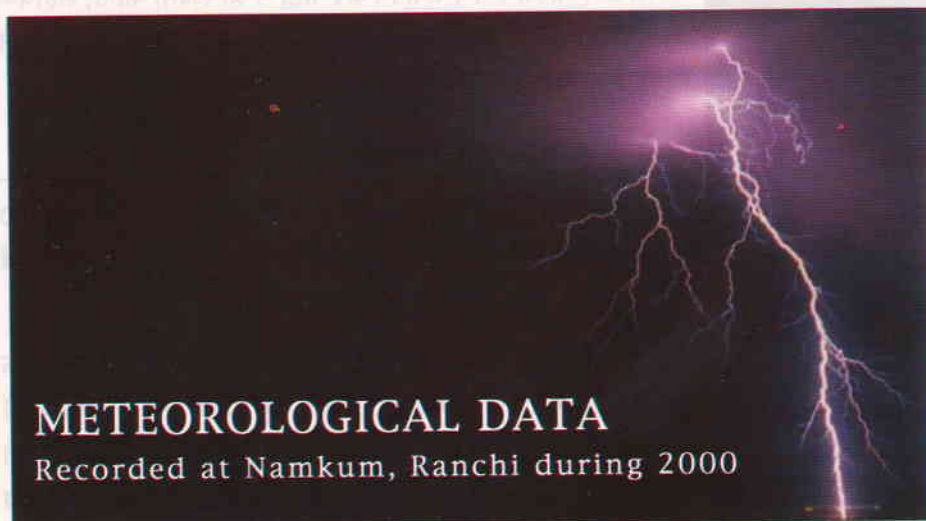
अखिल भारतीय राजभाषा विचार गोष्ठी में श्री लक्ष्मी कान्त, सहायक निदेशक (राजभाषा) एवं डॉ. अंजेश कुमार, हिन्दी अनुवादक ने भाग लिया।

हिन्दी कार्यशाला में सहभागिता

1. महाप्रबंधक, दूरसंचार, राँची द्वारा दिनांक 29-30 अगस्त 2000 को आयोजित हिन्दी कार्यशाला में श्री रामप्रताप तिवारी एवं श्री लक्ष्मी कान्त ने सहयोग किया।
2. राष्ट्रीय कृषि अनुसंधान प्रबंध अकादमी, हैदराबाद द्वारा दिनांक 28 एवं 29 नवम्बर 2000 को आयोजित ‘नई सहस्राब्दि में राजभाषा संकल्प’ विषयक हिन्दी कार्यशाला में श्री लक्ष्मी कान्त, सहायक निदेशक (राजभाषा) ने संस्थान का प्रतिनिधित्व किया।

Month	Maximum Temp (°C)	Minimum Temp (°C)	Mean Temp (°C)	Mean Rainfall (mm)	Mean Humidity (%)	Mean Wind Speed (kmph)	Mean Sunshine (hrs)	Mean Cloudiness (%)
Jan	28.5	15.2	21.8	12.5	75.2	15.8	185	65
Feb	30.1	16.8	23.4	15.2	78.5	16.2	195	68
Mar	32.5	18.5	25.5	18.8	82.1	17.5	215	72
Apr	35.2	20.1	27.6	22.5	85.8	18.8	235	75
May	38.5	22.5	30.5	28.2	88.5	20.5	255	78
Jun	40.2	24.8	32.5	35.5	90.2	22.2	265	80
Jul	38.8	23.5	31.1	42.2	88.5	21.5	255	78
Aug	36.5	22.2	29.3	48.5	85.2	20.5	245	75
Sep	34.2	20.8	27.5	52.2	82.5	19.5	235	72
Oct	32.5	19.5	26.0	45.5	78.2	18.5	225	68
Nov	30.8	18.2	24.5	32.2	75.5	17.5	215	65
Dec	29.2	17.5	23.3	22.5	73.2	16.8	205	62

The highest temperature is 40.2°C in June and the lowest is 15.2°C in January. The mean annual rainfall is 1885 mm. The mean annual sunshine is 2150 hours. The mean annual humidity is 78.5%.



METEOROLOGICAL DATA

Recorded at Namkum, Ranchi during 2000

Month	Mean Maximum Temp. (°C)	Mean Minimum Temp. (°C)	Mean Dry bulb Temp. (°C)	Mean Wet bulb Temp. (°C)	Mean Humidity (%)	Total rainfall (mm)	Highest Maximum Temp. (°C)	Lowest Minimum Temp. (°C)
January	25.54	7.72	20.21	16.23	66.35	23.4	28.5	4.4
February	23.74	10.41	18.53	15.15	69.37	37.5	27.5	5.1
March	31.64	15.24	26.06	21.71	67.22	5.0	34.5	10.0
April	38.09	20.37	26.64	23.19	73.06	9.0	43.0	18.3
May	36.78	22.49	28.85	25.78	78.06	119.5	42.2	17.7
June	32.38	21.91	27.10	24.84	82.76	207.5	37.0	19.0
July	30.38	22.20	26.96	24.74	82.93	293.0	35.7	20.0
August	34.30	23.80	27.50	26.40	91.00	151.0	36.0	20.0
September	34.65	22.05	24.60	23.39	88.26	168.0	36.0	18.8
October	34.37	17.45	26.15	25.3	89.86	12.0	36.0	13.0
November	30.52	12.43	23.58	20.35	72.16	Nil	35.5	9.2
December	25.80	7.24	18.27	14.60	65.90	Nil	27.5	5.5

The highest temperature	-	43°C on 29.04.2000
The lowest temperature	-	4.4°C on 16.01.2000
The total rain fall	-	1025.9 mm
Monsoon rain fall	-	819.5 mm
Hailstorm	-	None

PERSONNEL

As on 31.12.2000

Name	Designation
------	-------------

Dr K. K. Kumar	- Director (RMP)
----------------	------------------

Division of Lac Production

Dr. P. Kumar	- P. S. & Head of Division
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Dr. B. P. Singh	- Sr. Scientist (Agron.)
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Dr. A. Bhattacharya	- Sr. Scientist (Agric. Entomol.)
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Sri S. C. Srivastava	- Sr. Scientist (Plant Breeding)
----------------------	----------------------------------

Sri G. Singh	- Sr. Scientist (Soil Sc. & Agric. Chem.)
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Dr. S. N. Sushil	- Scientist (Agric. Ento.)
------------------	----------------------------

Sri S. K. Yadav	- Scientist (Agron.)
-----------------	----------------------

Sri Arvind Kumar	- Scientist (SW&CS)
------------------	---------------------

Sri D. Saha	- Scientist (Biotech.)
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Sri M. L. Rabidas	- F/F Tech. (T-II-3)
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Sri S. S. Prasad	- F/F Tech. (T-II-3)
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Sri K. P. Gupta	- F/F Tech. (T-II-3)
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Sri D. D. Prasad	- Lab. Tech. (T-II-3)
------------------	-----------------------

Sri R. K. Swansi	- Lab. Tech. (T-I-3)
------------------	----------------------

Sri Mohan Singh	- Lab. Tech. (T-I-3)
-----------------	----------------------

Sri D. W. Runda	- F/F Tech. (T-2)
-----------------	-------------------

Sri R. G. Singh	- F/F Tech. (T-1)
-----------------	-------------------

Division of Lac Processing and Product Development

Dr. P. C. Gupta	- P.S. & Head of Division (Org. Chem.)
-----------------	--

Dr. D. N. Goswami	- Sr. Scientist (Physics)
-------------------	---------------------------

Dr. N. Prasad	- Sr. Scientist (Org. Chem.)
---------------	------------------------------

Dr. R. N. Majee	- Sr. Scientist (Org. Chem.)
-----------------	------------------------------

Dr. K. P. Sao	- Sr. Scientist (Physics)
---------------	---------------------------

Dr. P. C. Sarkar	- Scientist (Org. Chem.)
------------------	--------------------------

Dr. V. K. Rao	- Scientist (Org. Chem.)
---------------	--------------------------

Sri S. K. Pandey	- Scientist (Mech. Engg.)
------------------	---------------------------

Sri S. K. Giri	- Scientist (AS & PE)
----------------	-----------------------

Sri S. K. S. Yadav	- Scientist (Org. Chem.)
--------------------	--------------------------

Dr. S. K. Srivastava	- Scientist (Org. Chem.)
----------------------	--------------------------

Sri F. Ansari	- Scientist (Org. Chem.)
---------------	--------------------------

Sri D. D. Singh	- Tech. Officer (T-5) Lab.
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Sri T. K. Saha	- Tech. Officer (T-5) Lab.
----------------	----------------------------

Sri Jagadish Singh	- Tech. Officer (T-5) Lab.
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Sri Bhola Ram	- Lab. Tech. (T-II-3)
---------------	-----------------------

Sri B. P. Ghosh	- Lab. Tech. (T-II-3)
-----------------	-----------------------

Sri M. K. Singh	- Lab. Tech. (T-II-3)
-----------------	-----------------------

Sri U. Sahay	- Lab. Tech. (T-II-3)
--------------	-----------------------

Sri B. P. Keshri	- Lab. Tech. (T-II-3)
------------------	-----------------------

Smt. Prabha Devi	- Lab. Tech. (T-I-3)
------------------	----------------------

Sri H. Das	- Lab. Tech. (T-I-3)
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Sri S. K. Tirkey	- Lab. Tech. (T-I)
------------------	--------------------

Sri Vinod Kumar	- Lab. Tech. (T-I)
-----------------	--------------------

Division of Transfer of Technology

Dr. K. K. Kumar,	- Head of Division
------------------	--------------------

Sri R. Ramani	- Sr. Scientist (Agric. Entomol.)
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Dr. K. M. Prasad	- Sr. Scientist (Org. Chem.)
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Sri Y. D. Mishra	- Scientist (Selection Gr.) (Agric. Entomol.)
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Sri R. Singh	- Scientist (Sr. Scale) (Phys. Chem.)
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Sri P.M. Patil	- Scientist (Sr. Scale) (Phys. Chem.)
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Sri M. L. Bhagat	- Scientist (Sr. Scale) (Agric. Entomol.)
------------------	---

Dr. A. K. Jaiswal	- Scientist (Sr. Scale) (Agric. Entomol.)
-------------------	---

Dr. K. K. Sharma	- Scientist (Sr. Scale) (Agric. Entomol.)
------------------	---

Dr. N. Prasad	- Scientist (Farm Machine & Power)
---------------	------------------------------------

Sri L. C. N. Shahdeo	- Tech. Officer- (T-5) Field Farm
----------------------	-----------------------------------

Sri M. Ekka	- Tech. Officer- (T-5) Lab.
-------------	-----------------------------

Sri K. K. Prasad	- Tech. Officer- (T-5) Lab.
------------------	-----------------------------

Sri D. K. Singh	- F/F, Tech. (T-II-3)
-----------------	-----------------------

Sri Vinod Kumar	- F/F, Tech. (T-II-3)
-----------------	-----------------------

Sri V. K. Tiwari - F/F, Tech. (T-II-3)
 Sri A. K. Sinha, - F/F, Tech. (T-II-3)
 Sri R. P. Srivastava - Jr. Artist-cum- Photographer
 (T-II-3)
 Smt. Ratna Dutta - Museum Assistant, (T-II-3)
 Sri P. A. Ansari - F/F, Tech. (T-2)
 Sri S. B. Azad - F/F, Tech. (T-2)
 Sri Madan Mohan - F/F, Tech. (T-1)

R.F.R.S., Dharmjaigarh, M.P.

Dr. S. K. Jaipuria - Sr. Scientist (Agric.
 Entomol.) I/c
 Sri Jiwan Lal - F/F, Tech. (T-I-3)

R.F.R.S. Balrampur, W.B.

Dr. A. Bhattacharya - Sr. Sc. (Agric. Entomol) I/c
 Dr. S. Ghosal - Scientist (Agronomy)
 Sri K. A. Nagruar - T-II-3

Director's /ARIS Cell

Dr. P. C. Sarkar - Scientist I/c
 Sri A. K. Sahay - T.O. (T-5) F.F.
 Sri D. Ganguli - T.O. (T-5) Lab.
 Sri Anant Pandey - Sr. Clerk
 Sri R. K. Rai - Lab. Tech. (T-1)

Administrative Section

Sri A Rastogi - Administrative Officer
 Sri R. K. Singh - Finance & Accounts Officer
 Sri A. K. Yadav - Security Officer
 Sri Nagendra Mahto - Asstt. Admin. Officer
 Sri Md. Samiullah - Asstt. Admin. Officer
 Sri R. Rabidas - Sr. P.A. to Director
 Smt. S. Prasad - Stenographer, Grade - II
 Sri A. K. Sinha - Stenographer, Grade - II
 Sri S. K. Yadav - Jr. Stenographer
 Sri R. B. Singh - Assistant
 Sri K. D. Pandey - Assistant
 Sri Budhan Ram - Assistant
 Sri K. N. Sinha - Assistant
 Sri Ravi Shanker - Assistant
 Sri Dudheshwar Ram - Assistant
 Smt. Sati Guha - Assistant

Sri Sudarshan Ram - Assistant
 Sri R. K. Upadhyay - Assistant
 Sri N. Topno - Assistant
 Sri Md. Mobarak - Assistant
 Sri Vijay Ram - Assistant
 Sri B. K. Rajak - Assistant
 Sri K. L. Chowdhury - Assistant
 Sri Emil Gari - Sr. Clerk
 Sri Thibu Minz - Sr. Clerk
 Sri Baijnath Gope - Sr. Clerk
 Sri Anant Pandey - Sr. Clerk
 Sri Prahlad Singh - Sr. Clerk
 Sri Bihari Sahu - Sr. Clerk
 Sri S. C. Lal - Sr. Clerk
 Sri Raghunath Mahto - Sr. Clerk
 Sri Wilson Guria - Sr. Clerk
 Sri K. Oraon - Sr. Clerk
 Sri Pranay Kumar - Sr. Clerk
 Sri A. K. Tripathi, - Jr. Clerk
 Sri Arjun Gope - Jr. Clerk
 Sri R. K. Toppo - Jr. Clerk
 Sri K. K. Deonath - Jr. Clerk
 Sri Samal Kumar - Jr. Clerk

Quality Control (Testing Lab.)

Sri D. Ghosh - T.O. (T-5) Lab.
 Sri K. M. Sinha - T.O. (T-5) Lab.
 Sri Ajay Kumar - Lab. Tech. (T-1)
 Sri Anup Kumar - Lab. Tech. (T-1)
 Sri B. K. Singh - Lab. Tech. (T-1)

Farm Unit

Dr. B. P. Singh - Sr. Scientist I/c
 Sri R. N. Vaidya - T.O. (T-5) F.F.
 Sri R. L. Ram - F/F Tech. (T-II - 3)
 Sri Satish Kumar - F/F Tech. (T-1)
 Sri S. K. Tripathy - F/F Tech. (T-1)
 Sri M. Surin - F/F Tech. (T-1)
 Sri S. K. Mukherjee - F/F Tech. (T-1)

Transport

Sri Bandhan Runda - Driver (T-I-3)

Sri Jaswant Tiwary - Driver (T-I)
 Sri Narayan Lakra - Driver (T-I)
 Sri Arvind Kumar - Driver (T-I)
 Sri M. Singh - Driver (T-1)
 Sri R. K. Yadav - Driver (T-I)

Medical Unit

Dr. N. P. Sahu, M.D. - Authorised Medical Attendant
 Sri C. Pandey - Stockman-cum- compounder
 (T-II-3)

Maintenance & Workshop

Sri S. K. Srivastava - T.O. (T-5)
 Sri S. K. Bhaduri - T. O. (T-5)
 Sri B. L. Dey - Boiler Attendant (T-II-3)
 Sri H. L. Bhakta - Instrument Mechanic (T-II-3)
 Sri I. Das - Asstt. Mechanic (T-I)
 Sri K. Tirkey - Turner (T-1)
 Sri Arjun Sharma - Carpenter (T-1)
 Sri B. S. Choudhary - Glass Blower (T-1)
 Sri R. K. Ravi - Wireman (T-1)

Library

Sri R. P. Tewari - T.O. (T-5)
 Sri V. K. Singh - T.O. (T-5)

Hindi Cell

Sri Lakshmi Kant - Asstt. Director (OL)
 Dr. Anjesh Kumar - Hindi Translator
 (T-II-3)

Promotion - Nil

Transfer

Sri Lakhan Ram - Publicity Officer to IVRI,
 Izatnagar, July, 2000

Retirement

Dr. S. C. Agarwal, ex-Director 31.01.2000
 Sri B. P. Banerjee 31.01.2000
 Tech. Officer (T-5)
 Sri Tulsi Ram (T -II-3) 31.01.2000
 Sri Mongal Munda 31.05.2000

Death

Sri J. K. Ambuj (T-2) 20.08.2000
 Sri R. Prasad, Tech. Officer 06.10.2000

Erratum :

Annual Report 1999-2000, P 34, II Column, last line

Instead

... of binder (from 8% to 10%), ...

to be read

... of binder (from 8% to 30%), ...

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