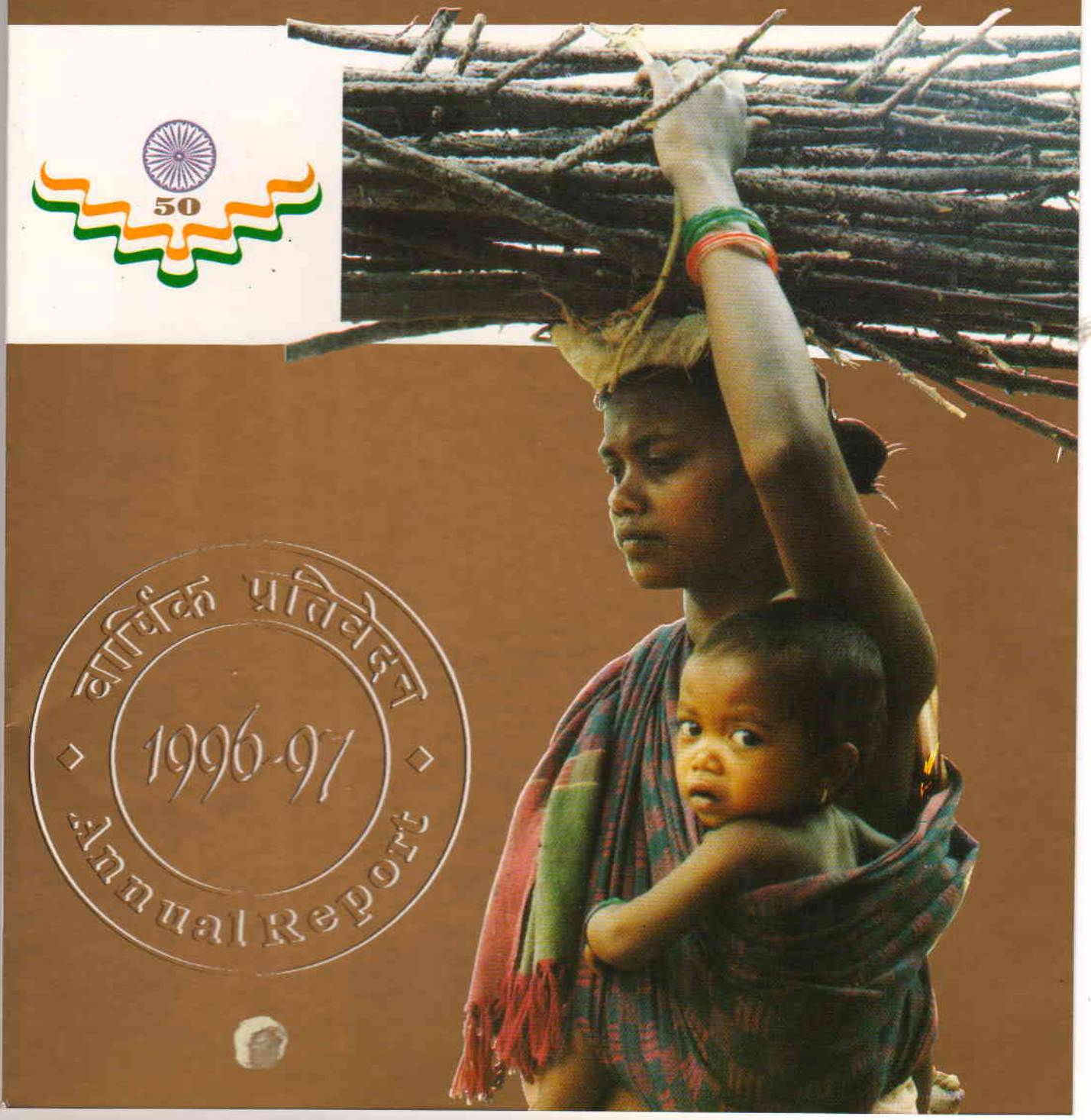
भारतीय लाख अनुसंधान संस्थान
राँची, भारत

Indian Lac Research Institute
Ranchi, India



वार्षिक प्रतिवेदन
1996-97
Annual Report

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1997

भारतीय लाख अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)
नामकुम, राँची 834 010, भारत

Indian Lac Research Institute
(Indian Council of Agricultural Research)
Namkum, Ranchi 834 010 India

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Contents

FROM DIRECTOR'S DESK

The year 1996-97 witnessed a reorientation of the research and extension programmes of the institute, in tune with the new directions envisioned by the ICAR for the functioning of its institutes. A perspective plan for the forthcoming quarter century, 'VISION 2020' was prepared after deliberations at various levels.

The two research divisions of the Institute continued their efforts for developing technologies for lac culture, processing and utilisation.

Research Highlights

Lac Production

Lac production technology for kusum

A modified production technology has been evolved, for *kusmi* brood lac as well as sticklac production in *kusum.*

Quick raising of akashmani *plantation*

Quick growth of *akashmani* plantation could be achieved through application of fertilizers, making the plants ready for raising lac crop within two years.

Laboratory rearing of beneficial parasitoids

Two potential parasitoids, for biological lac pest suppression, *Trichogramma pretiosum* and *Brachymeria tachardiae,* have been successfully reared in the laboratory.

Lac Product Development

Improvement in the yield of isoambrettolide

The yield of isoambrettolide from aleuritic acid has been improved from 58 to 72% by modifying the reaction conditions.

Antioxidants check degradation of lac in storage

Success has been achieved in checking the degradation of lac during its storage, using certain antioxidants.

Lac-based slow-release pesticide compositions

Slow-release pesticide compositions based on lac have been developed for the control of cockroaches and mosquito larvae.

TOT Programme

An improvement in the participation of lac farmers was achieved in one-day and one-week training programmes (43 and 16% respectively) on lac.

Seven on-farm training camps for popularising lac culture technologies were organised in different areas. The institute also put up stalls on lac in nine exhibitions, including, International Trade Fair.

Lac cultivation was introduced in Jiravar village and a demonstration of lac cultivation on 600 *palas* trees has been arranged.

Linkages have been established with a number of organisations for strengthening the extension activities of the institute.

National Seminar : Lac industry - challenges and solutions

A national seminar, 'Lac Industry - Challenges and Solutions' was organised on 14-15 June, 1996. The two-day seminar was co-sponsored by Biscolamf, Ranchi. The seminar was attended by 120 delegates and 16 research papers were presented. A list of recommendations was prepared after elaborate deliberations.

Contest on 'Radio Krishi Pathshala'

A contest was organised on the second *'Radio Krishi Pathshala'*, broadcast by AIR, Ranchi in collaboration with ILRI. Dr. R.S. Paroda, Secretary DARE & DG, ICAR gave away the prizes on a special prize distribution ceremony to the winners of the contest. A digest of all the talks of the programme was also released on the occasion.

Revolving Fund Scheme

A revolving fund scheme on 'Production of quality broodlac on *kusum* and *palas* in different agro-climatic regions' was sanctioned by ICAR. (Sri Y.D. Mishra, Sc. SG., Project Leader, Dr. A. Bhattacharya, Sr. Sc., Assoc. and Dr. K.K. Sharma, Sc. Sr. Sc., Assoc.)

Ad hoc Research Projects

An ad hoc research project, 'Lac productivity rating of different lac insects on conventional and promising lac hosts' (Sri Y.D. Mishra, Sc. SG, Project Leader, Dr S.N. Sushil, Sc., Assoc., Dr A. Bhattacharya, Sr. Sc., Assoc.) was granted by ICAR under A.P. Cess Fund.

The following ad hoc projects were also submitted during the period

- Pilot study on forecasting of broodlac yield from *Butea monosperma (palas)*
- Polyblends of shellac with synthetic polymers - formulation, characterisation and application studies

Dr S.C. Agarwal
Director

INTRODUCTION

The **Indian Lac Research Institute** (ILRI) was established, on the basis of a recommendation of an enquiry committee constituted by the Government of India to enquire into the condition of the Indian lac trade and suggest measures for its allround improvement. In order to implement this suggestion, members engaged in the lac trade at that time constituted themselves into a private registered body under the name, Indian Lac Association for Research. The association set up this institute in 1925. In 1931, the Indian Lac Cess Committee took over this institute. After the abolition of this committee, ILRI came under the administrative control of the Indian Council of Agricultural Research (ICAR), from Ist April, 1966.

The Institute

The ILRI is situated in the peaceful suburbs, nine kilometers east of Ranchi, on the Ranchi-Tatanagar highway and is spread over an area of 49 ha. Located in the main campus are : the Divisions of Lac Production, Lac Processing and Product Development and Transfer of Technology, the Administrative and Finance & Accounts Sections; the Library; the Director's Cell and the Mechanical Section; besides, the Dispensary and residential quarters. Adjoining this, is a small campus housing the Processing laboratory and the Staff quarters. The Institute has playground in both the campuses. Adjoining the campuses, there is a 36.5 ha plantation for field experimentation. The Institute also runs Regional Field Research Stations for lac in Madhya Pradesh, Orissa and West Bengal.

The ILRI is a pioneer organisation devoted to researches on cultivation, processing and utilisation of lac, which is mostly cultivated in an area of about 80,900 sq. km., by the tribal, of Bihar and adjoining states. Since its inception, the Institute has persistently endeavoured to develop and disseminate appropriate technologies to boost up lac production. A good number of products and processes have already been developed and efforts are continuing to explore newer areas in view of ever changing requirements of the industry. The Institute has attained international recognition for its contribution in cultivation and utilization aspects of lac.

Objectives

For Main Institute

- ◊ To develop lac culture technologies, adopting existing or genetically improved lac insect and hosts
- ◊ To develop lac processing techniques for the industry
- ◊ To conduct researches for diversification leading to pilot plant demonstration
- ◊ To transfer the technologies to farmers and to 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
- ◊ Broodlac production and exploitation of regional hosts
- ◊ Training of farmers for boosting the lac production in agro-forestry system
- ◊ Entrepreneurs awareness programme on regional basis

Organisational Set-up

The Institute is headed by a Director. The scientific manpower is deployed under three Divisions : (1) Lac Production, (2) Lac Processing and Product Development and (3) Transfer of Technology.

The Administrative wing comprises of Director's office, Administrative section, Purchase section, Finance & Accounts section and Central stores. The technical support is provided by the following sections : Library, Director's 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 56 scientific, 83 technical, 51 administrative and 110 supporting grade posts.

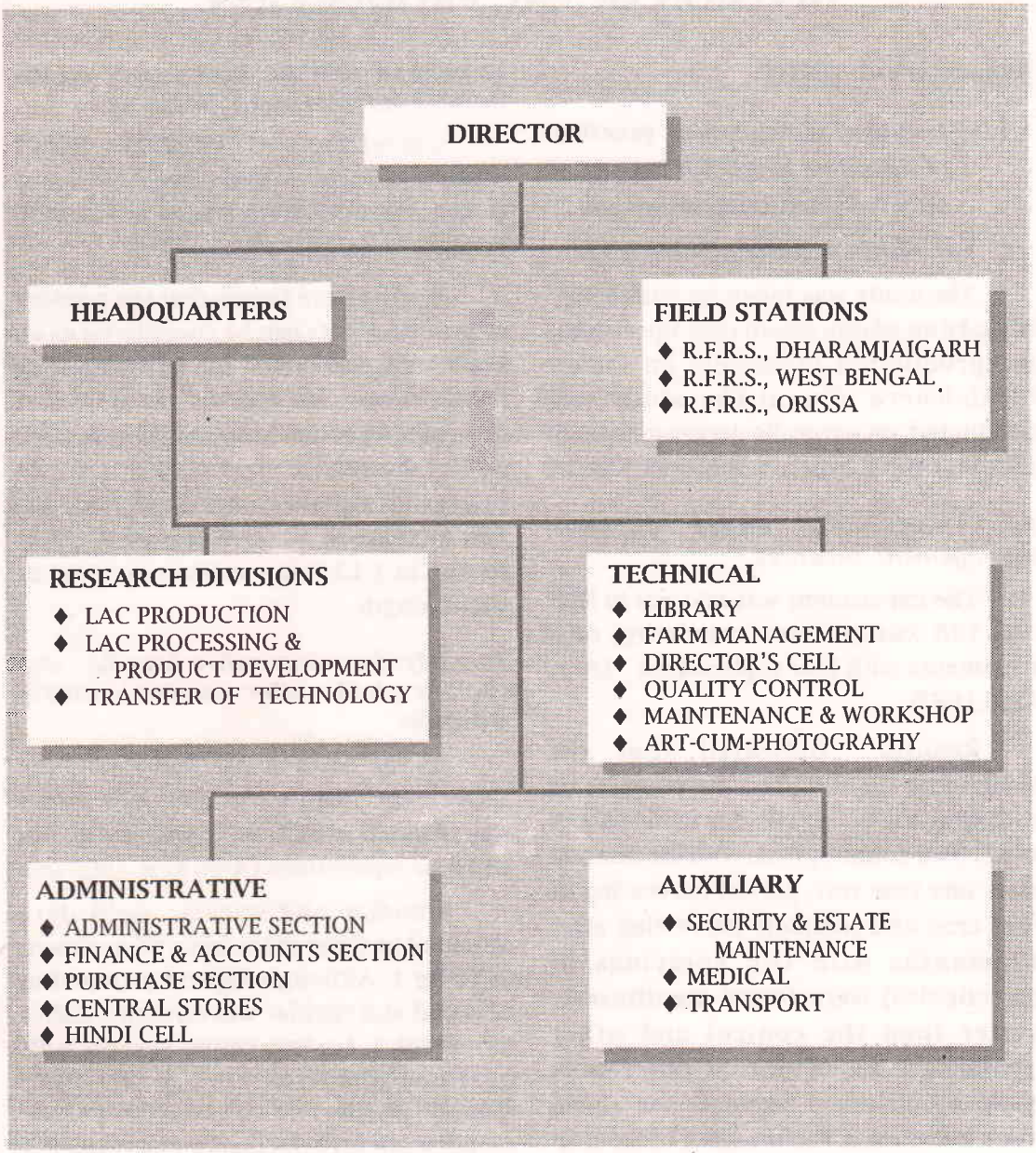
Budget

The details of the non-plan and plan expenditure during 1996-97 are shown in the Table below :

Budget of ILRI during 1996-97

Head of accounts/ Expenditure	BE 96-97 Rs (Lakhs)	RE 96-97 Rs (Lakhs)	Actual Expenditure Rs (Lakhs)
Plan			
Establishment Charges	6.00	6.50	6.44
Wages	7.00	0.00	-
OTA	-	-	-
T.A.	0.35	0.35	0.33
Other Charges including equipments	26.65	18.15	18.26
Works	20.00	25.00	24.83
Total	**60.00**	**50.00**	**49.86**
Non-Plan			
Establishment Charges	140.00	185.00	169.11
Wages	6.00	-	-
OTA	0.05	0.05	0.05
T.A.	1.60	1.60	1.60
Other Charges including equipments	18.35	30.35	30.51
Total	**166.00**	**217.00**	**201.27**

ORGANISATIONAL SETUP OF ILRI



PROGRESS OF RESEARCH

DIVISION OF LAC PRODUCTION

Research completed

1.1.9 To evolve management practices of *kusmi* lac insect for brood and sticklac production on *kusum*

(Y.D.Mishra and A.Bhattacharya)

The study was taken up with a view to make an advancement over the existing lac production technique on *kusum* (*Schleichera oleosa*).The study was conducted on naturally occuring trees of *kusum* at Hesal experimental area, Ranchi.

Lac crop yield under different management practices

The experiment was laid out in RBD on 128 *kusum* trees consisting of 8 treatments with four replications (*Ann. Rep. 1987*).

Results indicated that the treatments KD, KE (four coupe systems with spraying of insecticides twice) as well as KH (two coupe system with inoculation after one year rest, partial harvesting of first crop and complete harvesting after 12 months with two sprayings of insecticides) were found significantly better than the control and other treatments. No significant differences could be observed amongst the above three treatments. Performance of lac crop during *aghani* season was poor in case of four coupe system and yield of brood lac was equal to the quantity used (*Ann. Rep. 1994-95*).

Estimation of total shoot length on the basis of different plant attributes

Correlation of different plant attributes such as girth, height, area of crown and number of pruned points with total shoot length was studied.

Results have shown that the number of pruned points can be considered as an important parameter for estimation of total shoot length of *kusum* for determining actual broodlac requirement well in advance for crop inoculation . The regression equation indicated that one unit increase in number of pruned point results in 1.13 unit (metre) increase in shoot length.

To study the comparative broodlac and sticklac yield under various cultural schedules

On the basis of the findings of the above experiments, a new experiment was planned in RBD with six treatments and four replications (*Ann. Rep. 1995-96*).

Broodlac and sticklac yield data obtained in three years have been shown in **Table 1**. Although highest production of brood and sticklac was obtained under treatment T 1 (two coupe system with pest management), host plants were found to be adversely affected due to high lac infestation. Performance of treatments T 2 and T 3 (inoculation @ 20g broodlac per pruned point after 18 months of rest followed by partial harvesting after 6 months and complete harvesting after

one year with adequate pest management programme) was found significantly better than treatments T 4 and T 5, and therefore can be adopted under modified 5/4/3 coupe systems for sustained high broodlac and sticklac yield/year/tree.

It is thus evident from Table 1 that the combined system of treatment T 2 and T 3 which is better than the existing system is T 4 and T 5 (in combination) and can be adopted especially during summer and excessive rains. Comparative economics of various cultivation schedules have also been calculated on per hectare per year basis. Seventy average-sized *kusum* trees, each having a spread of approximately 300 pruned points can be accomodated in one hectare.

Forecasting lac crop yield on kusum

Yield of lac from standing lac crop on *Schleichera oleosa* was estimated in terms of length of coverage by the lac insects and broodlac / scraped lac output, with the help of multiple regression analysis. The number of pruned points and quantity of broodlac used per tree together explained 79 and 59 % variation in length of coverage during winter

Table 1 Mean* broodlac and scraped lac yield per pruned point and yield ratio on *kusum* under various treatments

	Yield per pruned-point (kg)			Yield Ratio (yield/used)	
Treatments	Lac Stick	Broodlac	Scraped lac	Brood lac	Scraped lac
T1	0.246	0.149	0.088	6.377	8.304
T2	0.169	0.106	0.075	5.369	6.919
T3	0.190	0.150	0.083	7.046	7.612
T4	0.141	0.095	0.060	4.724	6.224
T5	0.090	0.044	0.032	2.368	3.204
T6	0.103	0.039	0.032	1.662	1.570

** Mean of 1993-94, 1994-95 & 1995-96*

Table 2 Economics of broodlac and sticklac production under new systems of lac cultivation compared to villager's method

System of lac cultivation	Percent no. of trees* exploited	Yield Kg/ha/yr		Input Rs/ha/yr		Profit Rs/ha/yr		% Gain	
		Broodlac	Sticklac	Broodlac	Sticklac	Broodlac	Sticklac	Broodlac	Sticklac
Two coupe system (*Aghani cum jethwi*)	50	1,564.5	924.0	28,385	2 8,385	60,560	34,195	213	120
Five coupe system	40	1,075.0	663.6	22,708	22,708	41,745	15,527	184	68
Four coupe system	50	729.4	483.0	29,000	29,000	23,596	5,935	81	20
Villager's method	100	423.0	224.0	25,200	25,200	15,750	00	22	nil

* *Indicates trees having 300 pruned points.*
Figures have been calculated at plant density of 70 kusum *trees / hectare.*

(*aghani*) and summer(*jethwi*) season crop respectively. The length of coverage by the insects, number of pruned points and the quantity of broodlac used per tree explained 88 and 42 % variation in yield of broodlac and scraped lac respectively during summer crop (**Tables - 3 & 4**).

Lac pest management for lac production on kusum

In addition to the lepidopterous predators of lac, two species of *Chrysopa* have been found to regularly cause substantial damage during rainy season. Chemical control measures using BHC or chlordane evolved earlier were not found practicable as these insecticides have been banned. A chemical control schedule for management of neuropteran and lepidopterous predators by spraying 0.03% dichlorvos at peak infestation period was evolved after laboratory and field experiments (*Ann.Rep.1995-96*).

Fungal infestations have been found to cause damage to *aghani* lac crop. Three concentrations of two systemic fungicides were tested for their safety to lac insects and also evaluated in combination with recommended insecticides under field conditions during rainy season. Repeated spraying of combination of 0.03 % dichlorvos, 0.01 % endosulfan and 0.01 % carbendazim, three or four times at three weeks interval accounted for two to three fold increase in sticklac yield (**Table 5**).

Table 3 Regression equations between broodlac/scraped lac yield and various characters for *jethwi* crop of *kusmi*

Character	Parameters	Mean	Intercept const.	Partial regression coef. b_1	b_2	b_3	R^2	F-Value
Broodlac yield	Length of insect coverage(x_1,m)	29.05	0.094	0.106** (13.76)	-	-	0.79**	189.21
	No.of pruned points (x_2)	48.28	0.165	0.108** (9.39)	-0.003 (0.32)	-	0.79**	92.99
	Quantity of broodlac(x_3,Kg)	1.07	0.061	0.126** (13.84)	0.033** (3.51)	-1.99** (6.30)	0.88**	123.27
	x_2,x_3	-	-0.010	-	0.080** (4.28)	-0.666 (1.01)	0.43**	18.55
Scraped lac yield	Length of coverage(x_1.m)	29.05	0.357	0.055** (5.94)	-	-	0.41**	35.54
	No.of pruned points (x_2)	48.28	0.351	0.054** (3.94)	0.0003 (0.02)	-	0.41**	17.32
	Quantity of broodlac(x_3,Kg)	1.07	0.323	0.059** (4.07)	0.010 (0.65)	-0.520 (1.04)	0.42**	11.92
	x_2,x_3	-	0.291	-	0.032* (2.04)	0.098 (0.18)	0.23	7.33

Figures in parentheses are t values
*** Significant at 1 %*

Table 4 Correlation coefficients between various characters associated with *kusmi* lac crops

Characters	*Aghani* (winter)			*Jethwi* (summer)		
	x_1	x_2	x_3	x_2	x_3	x_4
Length of insect coverage (x_4/y)	0.942**	0.889**	0.709**	0.889**	0.709**	-
Total shoot length (x_1)	-	0.890**	0.760**	-	-	-
No. of pruned points (x_2)	-	-	0.768**	-	-	-
Quantity of broodlac (x_3)	-	-	-	0.768**	-	-
Yield of scraped lac (y_2)	-	-	-	0.476*	0.402*	0.640**
Yield of broodlac (y_3)	-	-	-	0.644*	0.465*	0.888**

, Significant at 5 and 1 % level respectively*

Table 5 Effect of different pesticides, alone or in combination, on lac crop yield from *kusum* during rainy season

Treatments	Pesticides	Concentration (%)	Average yield per metre shoot (g)	Percent increase in yield over control
Two sprays, at four-week interval				
T 1	Endosulfan	0.05	17.22	72.00
T 2	Dichlorvos	0.03	12.95	29.37
T 3	Carbendazim	0.01	12.57	25.57
T 4	Endosulfan	0.05		
	+ Carbendazim	0.01	25.34 **	153.15
T 5	Dichlorvos	0.03		
	+ Carbendazim	0.01	20.42	104.00
T 6	Endosulfan	0.01		
	+ Dichlorvos	0.03		
	+ Carbendazim	0.01	26.59 **	165.63
Three sprays, at three - week interval				
T 7	Endosulfan	0.05	16.95	69.33
T 8	Dichlorvos	0.03	9.99	
T 9	Carbendazim	0.01	24.42 *	143.96
T 10	Endosulfan	0.05		
	+ Carbendazim	0.01	20.80	107.79
T 11	Dichlorvos	0.03		
	+ Carbendazim	0.01	16.58	65.63
T 12	Endosulfan	0.01		
	+ Dichlorvos	0.03		
	+ Carbendazim	0.01	31.99 **	219.58
T 13	Control		10.02	
S.Em ±			3.897	
C.D. at 5 %			11.15	
C.D. at 1 %			14.97	

**, ** - Significant at 5 and 1% level respectively*

Researches in Progress

1.1 Improvement in lac cultivation techniques

1.1.10 Evolution of cultivation schedule on *akashmani* (*Acacia auriculaeformis*) for growing *kusmi* and *rangeeni* crops

(S.G.Choudhary, A.H.Naqvi, B.S.Rayudu)

The project aims at evolving a suitable lac cultivation schedule for raising *kusmi* and *rangeeni* crops on *akashmani* by finding out i) a suitable pruning technique, ii) optimum age of shoots for crop inoculation, iii) optimum brood requirement for maximising yield, iv) performance of alternation of brood lac with conventional hosts and vice-versa and finally evolving a suitable cultivation schedule based on above findings.

Pruning trial

The total inoculable shoot length, 18 months after pruning, in relation to the number of pruned points of *akashmani* and *kusum* trees were determined (**Table 6**).

Baisakhi *and* baisakhi *cum* katki *crop*

Experiment was also carried out for determining suitability of host for raising *baisakhi* cum *katki* crop for complete harvesting once in a year similar to that followed for conventional host *palas* in hot areas and comparing it with that of *baisakhi* and *katki* yield together. Crop inoculation was done at the brood rate of 10-20g/m shoot length.

Field trials for alternation of broodlac

Kusmi and *rangeeni* broodlacs obtained from *akashmani* were inoculated on *akashmani* (AxA) and on conventional hosts *kusum* and *palas* (AxK and AxP) of similar inoculable area at similar brood rate, while brood lacs of conventional hosts viz., *kusum* and *palas* were inoculated on *akashmani* (KxA and PxA) as well as also on the conventional hosts (KxK and PxP) for comparison.

During July'96, *katki* '96 and *aghani* '96-97, crops were raised on *akashmani,* 18 months after pruning, at the brood rate of 15- 20g/m shoot length.

Baisakhi 1996-97 crop was raised on *akashmani, palas* and *galwang* and *jethwi* '97 crop on *akashmani, kusum* and *galwang* at the brood rate of 15-20g/m shoot length. Inoculations were also done for raising *baisakhi* cum *katki* '96-97 and *jethwi* cum *aghani* '97-98 crops on *akashmani* at 10-15g/m shoot length.

During the period under report, harvesting of crops on *akashmani* viz., *baisakhi* '95-96, in July, *katki* '96 and *baisakhi* cum *katki* '95-96 in Oct., and *aghani* '96-97 crop during Feb. was done and yield/tree was recorded for comparison. Also summer season crops viz., *baisakhi* '95-96 and *jethwi* '96 respectively on *palas* and *kusum* trees were harvested during July '96 and yield/tree was recorded. Yields obtained from *baisakhi* '95-96 and *baisakhi* cum *katki* '95-96 are presented in **Table 7**, where as yields obtained from *aghani* '96-97 on *akashmani* and *jethwi* '96 on *kusum* trees are appended in **Table 8**. Yield data of

performance of alternation of brood lac is presented in **Table 9.**

The results show that the yield ratio is higher during rainy and rainy *cum* winter season crops in comparison to summer season crop on this host and as such is a suitable host for rainy season crops. The alternative summer season crops yielded more on conventional hosts indicating that *palas* and *kusum* are suitable for summer season crops viz., *baisakhi* and *jethwi* in alternation.

Further, the alternation of brood lac from *akashmani* to conventional host viz., *palas* and *kusum* and vice-versa was found to be successful, whereas continuous use of *akashmani* brood lac again on *akashmani* led to a gradual decrease in yield in successive years. Yields were higher during first alternation year on conventional hosts which too gradually decreased by continuous alternations of the same brood.

Cultivation technique on akashmani *in alternation with* kusum *and* palas

During the period under report, field trials were carried out to evolve a suitable cultivation schedule on *akashmani* in alternation with conventional hosts, *kusum* and *palas*

Four coupe system of lac cultivation was followed for both *kusmi* and *rangeeni* strain crops. *Akashmani* trees were divided into 4 coupes i.e., 2 coupe each for raising *katki* and *aghani* crops. *Kusum* and *palas* trees, with similar inoculable area as of *akashmani* were similarly divided into 2 coupe each for raising *jethwi* and *baisakhi* crops.

Table 6 Relationship between pruned points and resultant inoculable shoot length of trees pruned during different months

Host	Month of pruning	Mean no. of pruned points/tree	Mean available shoot length after pruning (m)
Akashmani	February	8.6	4.9
	July	7.4	5.2
	October	4.7	4.5
Kusum	February	130.20	1.41

Table 7 Yield of lac per 50 m inoculable length at different brood rates on *akashmani* (*baisakhi*, 1995-96 and *baisakhi*- cum- *katki*, 1995-96)

Treatment brood rate (g/m) shoot length	Brood used (g)		Yield obtained (g)			Yield ratio	
	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
10 *Baisakhi*	500	84.6	384.6	692.3	75.3	1:0.76	1:0.88
15 1995-96	750	145.8	791.6	506.8	139.5	1:1.05	1:0.95
20	1000	197.6	1214.2	1000.6	295.2	1:1.21	1:1.49
25	1250	296.0	1400	1205.9	216.6	1:1.12	1:0.72
10 *Baisakhi* cum	500	85.1	1564.9	2797.2	289.3	1:3.10	1:3.4
20 *katki* 1995-96	1000	160.9	2708.1	4594.5	516.9	1:2.70	1:3.2

Table 8 Yield of lac during *aghani* 1996-97 on *akashmani* and during *Jethwi* 1996 on *kusum*

Treatment	Brood used (g)		Yield obtained (g)			Yield ratio	
	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
KxA (*aghani* 96-97)	450	146.8	520.5	415.2	193.6	1:1.15	1:1.31
AxK (*Jethwi* 96)	450	140.0	454.5	535.6	198.3	1:1.01	1:1.4

K - Kusum, A - Akashmani

Table 9 Performance of alternation of brood lac of *akashmani* with *palas* and *kusum*

Treatment	Brood used (g)		Yield obtained (g)			Yield ratio	
	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
AxP	1000	136.3	3072.7	300.9	685.4	1:3.07	1:5.02
PxA	1000	145.8	2750.8	1200.6	504.8	1:2.75	1:3.46
PxP	1000	152.1	2739.4	313.4	615.8	1:2.73	1:4.04
AxA	1000	123.6	1115.0	618.1	129.0	1:1.11	1:1.04
KxA	1000	313.4	1626.9	1944.4	592.2	1:1.62	1:1.88
AxK	1000	215.7	794.18	209.3	198.7	1:0.79	1:0.92
KxK	1000	323.5	1007.3	661.7	477.6	1:1.00	1:1.47
AxA	1000	225.4	892.5	335.4	245.8	1:1.19	1:1.09

A- Akashmani, P - Palas, K - Kusum

1.1.12 To evolve management practices of *rangeeni* lac insect for brood and stick lac production separately on *palas* and *ber*

(S.G.Choudhary, A.H.Naqvi and M.L.Bhagat)

Various field trials were conducted for i) improving management practices for sustained production of quality brood lac and maximising the yield of stick lac and ii) developing a methods for estimating broodlac requirement and forecasting the crop yield.

Techniques for palas

Separate experiments as mentioned below were carried out as per the technical programme (*Ann.Rep.1994-95*) for different crops viz., *baisakhi, baisakhi*-cum- *katki* and *katki* crops with different treatments.

Optimum brood requirement for maximising brood and stick lac production

Summer crop : *Baisakhi* '95-96 crop was raised using brood rates ranging from 10-40g/m shoot length harvested during July'96 and the results are given in **Table 10**.

Rainy season crop : Two separate experiments were carried out in RBD during *katki*'96 crop season. In the first experiment, six treatments of different brood rates ranging from 10-35g/m shoot length with 4 replicates were tried. Brood rate of 15-20g/m shoot was found to be optimum for crop yield per tree, in terms of ratio of brood and sticklac obtained.

In the second experiment, the crop was raised at medium brood rate of 15g/m shoot length and different pest management techniques were applied in integration.

The crop was raised after insecticidal treatment of brood lac, in all the treatments except the control. For trap cropping 1/3rd trees were inoculated heavily at 60g/m shoot length.

The results of the second trial indicate that integration of two sprays of Thiodan + BHC each at 0.05%, cultural method of trap cropping and use of brood lac after dipping in 0.05% Thiodan for inoculation resulted in best brood and stick lac yields. One spraying was effective for stick lac production only.

Optimum brood requirement for summer-cum- rainy season crop

Inoculations were made at different brood rates (10-30g/m shoot length) during Oct.'95 and the mature crop was allowed for self inoculation for complete harvesting in Oct.'96. The crop was raised with treated brood lac, 1/3rd trees were inoculated heavily for trap cropping and three insecticide sprayings (March/April, August and Sept.) were given on the crop. The brood rate of 10-15g/m shoot length is optimum for higher yields (**Table 11**). The crops were again raised in Oct. 96 for repeating the experiment.

Techniques for ber

Optimum brood requirement for increased ari *lac yield in summer crop*

Field trials were repeated in RBD with six treatments of different brood

Table 10 Yield of lac (*baisakhi* '95-96) per 50m inoculable length on *palas* at different brood rates

Treatment	Brood used (g)		Yield obtained (g)			Yield ratio	
brood rate (g/m) shoot length	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
10	500	62.5	1125.0	875.0	237.5	1:2.2	1:3.8
15	760	126.9	1257.6	1153.8	344.6	1:1.6	1:2.7
20	1000	140.8	1637.9	755.8	405.1	1:1.6	1:2.8
25	1250	184.8	1344.5	1117.6	273.5	1:1.07	1:1.4
30	1500	250.0	3571.4	1214.2	971.4	1:2.3	1:3.8
40	2000	312.5	2812.5	937.5	687.5	1:1.4	1:2.2

Table 11 Yield of lac (*baisakhi*-cum-*katki* 1995-96) per 50m shoot length, on *palas*, at different brood rates

Treatment	Brood used (g)		Yield obtained (g)			Yield ratio	
brood rate (g/m) shoot length	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
10	500	59.3	1750.0	1468.7	340.60	1:3.50	1:5.70
15	750	95.0	3368.0	2137.5	606.25	1:4.49	1:6.38
20	1000	125.7	3074.2	2265.6	515.70	1:3.07	1:4.12

rates ranging from 10-40g/m shoot length with 4 replications.The crop was raised during Oct.'95 and the *ari* lac was harvested during May,96 and yield/tree was recorded for comparison. Brood rate of 20g/m shoot length was found optimum for yield ratio in terms of sticklac (**Table 12**).

Optimum brood requirement for summer crop

Field trials were repeated in RBD at different brood rates for raising *baisakhi*'95-96 crop on *ber*. Trees inoculated during Oct.,95 were harvested during July '96 and yield/tree was recorded. Brood rate of 10-15g/m shoot length was optimum for increased brood and stick lac yields (**Table 13**).

Optimum brood requirement for summer cum rainy season crop

Field trials were repeated in RBD using four brood rates (treatments) replicated 6 times for raising *baisakhi* - cum- *katki* crop. Trees were inoculated in Oct. '95 at different brood rates (5-20g/m shoot length) and harvested during Oct. '96. Brood rate of 5-10g/m shoot length was optimum for increased yield of brood and sticklac in terms of ratio obtained (**Table 14**).

Table 12 *Ari* lac yield (*baisakhi*-95-96) per 50m inoculable are on *ber*, at different brood rates

Brood rate g/m shoot length	Brood lac used(g) (in terms of scraped lac)	Yield obtained (g) (in terms of scraped lac)	Yield ratio brood: yield (in terms of scraped lac)
15	75.3	390.5	1:5.1
20	118.5	935.7	1:7.8
25	125.0	925.0	1:7.4
30	212.5	930.0	1:4.3
40	280.0	1000.0	1:3.5
50	350.0	1137.5	1:3.2

Table 13 Yield of lac from *baisakhi*-95-96 per 50m inoculable length at different brood rates on *ber*

Treatment	Brood used (g)		Yield obtained (g)			Yield ratio	
brood rate (g/m) shoot length	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
50	250	40	539.4	1460.5	197.3	1:2.1	1:4.9
10	500	75	2395.0	1785.7	467.8	1:4.7	1:6.2
15	750	100	2686.1	1018.05	687.5	1:3.5	1:6.8
20	1000	125	6363.6	3409.09	931.8	1:6.3	1:7.4
25	1250	165	5923.07	1884.6	998.4	1:4.7	1:5.4
30	1500	190	2500	625	340.6	1:1.6	1:1.7

Table 14 Yield of lac (*baisakhi*-cum-*katki* '95-96) at different brood rates on *ber* per 50m shoot length

Treatment	Brood used (g)		Yield obtained (g)			Yield ratio	
brood rate g/m shoot length	Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
5	250	35.2	630.6	2039.7	217.4	1:.25	1:6.1
10	500	73.3	1190.4	4666.5	550.5	1:2.3	1:7.5
15	750	95.0	1425.0	6750.0	531.6	1:1.9	1:5.5
20	1000	143.6	1520.3	6550.0	591.4	1:1.5	1:4.1

Optimum brood requirement and brood and stick lac production technique for rainy season crop

Two experiments were repeated during rainy season (*Katki* crop). In the first experiment, inoculations were done at different brood rates during July '96. Optimum brood requirement was 15-20g/m shoot length for increased yield in terms of ratio of brood and stick lac obtained.

In the second experiment, inoculations were done with treated broodlac in all treatments except the control at medium brood rate of 10-15g/m shoot length. Trap cropping was done by inoculating heavily 1/3rd trees at 60g/m shoot length.

The treatments were

BA: one insecticidal spray in August

BB: integrated control schedule (insecticidal treatment of brood lac, trap cropping and combined spray (BHC + Thiodan) in August

BC: Control (no treatment)

BD: Same as BB with combined insecticidal spraying (BHC+Thiodan) in September additionally

The treatment BD was highly effective for brood as well as sticklac yield in relation to the brood used (**Table 15**).

Table 15 Lac yields (*katki* '95) per 50m inoculable length on *ber*, under different treatments

Treatment / brood rate (g/m) shoot length		Brood used (g)		Yield obtained (g)			Yield ratio	
		Brood lac	Scraped lac	Brood lac sticks	Rejected lac stick	Total scraped lac	Brood used : brood obtained	Scraped lac of brood used : total scraped lac yield
BA(one spraying)	15	740	128.7	1268.9	1060.6	356.06	1:1.7	1:2.7
	20	1005	180.5	2340.2	1111.1	555.5	1:2.3	1:3.4
BB	15	740	125.0	1155.5	530.7	250.4	1:1.5	1:2.0
	20	1005	163.1	1875.6	870.6	342.3	1:1.8	1:2.0
BC(no spraying)	15	740	128.5	1000	892.8	342.8	1:1.3	1:1.9
	20	740	180.0	1150.6	640.7	354.2	1:1.5	1:1.9
BD(two sprayings)	15	740	125.0	1856.6	1515.1	571.9	1:2.5	1:4.5
	20	1005	180.5	2743.05	1215.2	687.5	1:2.7	1:3.8

1.4 Control of enemies of lac insect

1.4.21 Lac pest management through bioecological approaches

(A.Bhattacharya, A.K. Jaiswal, Y.D.Mishra, K.K.Sharma and S.N.Sushil)

Allelo-chemical interactions in biotic complex of lac insect

To detect the presence of any kairomone in *Eublemma amabilis* and *Pseudohypatopa pulverea* for its parasitoids, living larvae and pupae as well as fresh excreta of both the predators were collected and extracted with methylene chloride, separately. The extract were then filtered and evaporated to dryness. The residues obtained were subjected to assay for kairomonal activity. The residue obtained from larvae and excreta of *E. amabilis* and *P. pulverea* were tested against females of *Bracon greeni* and *Pristomerus sulci* respectively, using an olfactometer. The attraction of the two parasitoids were more towards the larval extract.

Three different concentrations of tryptophan in sugar solution was sprayed on lac culture on *Flemingia macrophylla* bushes. In control, spraying was done with sugar solution only.The result of first spray have indicated that plots treated with tryptophan in sugar solution had higher number of eggs per plant than those under control.

Seasonal abundance of lac associated fauna

Studies carried out during summer season crop on relative abundance of lac associated fauna revealed that *rangeeni* strain was more susceptible to pests as compared to *kusmi*. Incidence of predators in both the strains was comparatively less. The early maturing *kusmi* crop particularly, was devoid of predators. This may be attributed to the fact that the crop was inoculated in December, when normally the predators remain within the *phunki* sticklac. Inimical parasitoids constituted bulk of the fauna in crops of both the strain. Amongst the harmful parasitoids *Aprostocetus (Tetrastichus) purpureus* and *Tachardiaephagus tachardiae* were two major insects ranging from 78.19 % in the *rangeeni* crop to 96.22 % of the total insect fauna recorded in the *kusmi* early variety crop (**Table 16**).

Preliminary studies were also carried out to record the emergence of pests from stored *phunki* lac sticks. *Phunki* lac sticks weighing 3.5 Kg were stored during July 1996, in cages fitted with glass tubes. The number of *Pseudohypatopa pulverea*, *Pristomerus sulci*, *Apanteles tachardiae* and *Aprostocetus purpureus* emerged till March 1997 were recorded to be 200, 57, 1 and 3 respectively. *P.pulverea* is a recorded predator of stored lac and *A.tachardiae* and *P.sulci* are its known parasitoids. However, emergence of *A.purpureus* which is a recorded pest of lac insects, *Coccophagus tschirchii* and *A.tachardiae* after nine months of storage probably due to parasitization of *P.pulverea* and its parasitoids under food stress conditions.

Table 16 Relative abundance (%) of predators and parasitoids associated with two strains of lac insect during summer crop of 1996-97 (per metre encrustation)

Fauna	*Kusmi*				*Rangeeni*	
	Late		Early			
Predators	5.55	(11.67)	0.26	(0.50)	0.03	(26.67)
Beneficial parasitoids	2.45	(5.33)	1.41	(2.67)	4.46	(14.83)
Inimical parasitoids						
T.tachardiae (B_1)	29.08	(61.16)	92.59	(175.17)	44.69	(148.50)
T.purpureus (Y_2)	59.51	(125.18)	3.63	(6.84)	33.50	(111.31)
Others	3.32	(7.01)	2.11	(4.00)	9.32	(30.98)
Total	**100.00**	**(210.35)**	**100.00**	**(189.18)**	**100.00**	**(332.29)**

Figures in parentheses are original values

Biological control of lac predators

Attempts were made to parasitize the lac predator *Pseudohypatopa pulverea* with the egg parasitoid *Trichogramma pretiosum*, which has also parasitized the eggs of *Eublemma amabilis* recently under laboratory conditions. Four replications each consisting of 10 eggs were exposed to adults of *T. pretiosum* in glass tubes (20x2.5 cm.). Parasitized eggs were counted and the emergence of egg parasitoid was recorded to be 40%. The parasitoid completed its life cycle within 9-10 days on *P.pulverea* eggs. This is the first record of parasitization of *P.pulverea* eggs by *T.pretiosum* under laboratory condition.

Brachymeria tachardiae, an endo-pupal parasitoid of *E. amabilis* and *P. pulverea* was artificially reared under laboratory condition on laboratory cultured *Corcyra cephalonica* pupae. The pupae of *C. cephalonica* were glued on paper cards and placed within glass chimneys closed at both ends by muslin cloth. The experiment was conducted during July to October. The percent parasitization of the pupae varied from 30 to 60%. The life cycle of the parasitoid completed in 13-17 days during July/ August while it took 17 to 21 days during September/October. In another study the longevity of laboratory reared *B. tachardiae* adults was found to range from 25 to 61 days during October-December,1996.

Attempts were made to rear *Bracon greeni*, a larval ecto-parasitoid of *E. amabilis* by adopting the methodologies utilized for laboratory rearing of other species of *Bracon*. Mature larvae (4th/5th instar) of *C. cephalonica* were kept for two min in deep freeze and were then placed over the open end of glass chimney by sandwitching them between single layers of muslin cloth and tissue paper. Adult *B. greeni* were released from the other open end of the chimney for parasitizing the larvae. Successful parasitization, however, could not be achieved.

Eggs of lac predator, Eublemma amabilis, *parasitised by potential biocontrol parasitoid,* Trichogramma pretiosum

Eggs of Chrysopa *sp., a sporadic lac predator*

Brachycyrtus eublemmae, an ichneumonid pupal endoparasitoid of *Chrysopa* sp. has been recorded for the first time. It was believed to be a parasitoid of *Eublemma* species.

An experiment was conducted to study the effect of UV radiation on eggs of *E. amabilis* to check the embryonic development, so that they remain suitable for parasitism for a much longer duration.

One to three days old eggs of *E. amabilis* were exposed to UV radiation in a closed chamber at a distance of 55 cm from a 30 watt source for 5,10,15,20 and 25 minutes. An untreated control was maintained for comparison. Each treatment consisted of 25 eggs replicated four times. The eggs after treatment were kept at room temperature for recording larval hatching. The mortality of the treated eggs was recorded on the basis of number of hatched larvae which is given in **Table 17**.

Table 17 Effect of uv exposure in *E. amabilis eggs*

Exposure duration (minutes)	Average percent mortality of eggs
0 (Control)	6.78
5	24.07
10	61.11
15	83.17
20	84.40
25	90.99

LT_{50} = 9 min 18 sec.; LT_{90} = 21 min 45 sec.

1.5 Genetics and breeding of lac insects

1.5.8 To collect, conserve and characterise lac insect gerplasm

(S.K.Jaipuriar and S.K.Saha)

A total of twelve stocks of both *kusmi* and *rangeeni* strains of lac insect germplasm collected from different ecological regions as well as a trivoltine race collected recently from coastal region of West Bengal (Amarsi, Midnapur) have been maintained on *Flemingia*

Table18 Biological and industrial parameters of some stocks of lac insect germplasm during summer generation

Description of the stock	Biological attributes of lac insect			Industrial parameters of lac			
	Life period in days	Fecundity per female	Resin secretion (mg)	Flow (mm)	Colour index	Wax (%)	Melting point (°C)
(*Rangeeni*)							
MaliBasantpur crimson	261	395	15	47	-	4.28	81
MaliBasantpur yellow	263	356	12	42	15	4.30	82
Balrampur	246	343	14	32	16	4.25	82
Turhamu	276	249	14	42	15	4.32	82

macrophylla and evaluated for different biological characteristics of the insects and the industrial parameters for the resin produced by them.

Among *rangeeni*, the crimson lac insects from Mali Basantpur was found to be superior in respect of biological and industrial parameters (**Table 18**).

1.5.13 Breeding superior lac insects for resin colour and productivity

(R.Ramani and K.K.Sharma)

Crosses were made between experimental lines of *rangeeni*, *kusmi* and the trivoltine race (from coastal West Bengal) during July-August. The F_1 progenies of these crosses are being maintained for evaluation of their biological and resin characteristics.

A study was taken up to understand the genetic influence of sex ratio, an important factor influencing the per unit lac productivity, in relation to density of lac insects on the host plant. An experiment was conducted during *baisakhi* crop generation using a wild *rangeeni* line cultured on potted *bhalia* plants. The lac insects were restricted to settle on 15 cm shoot length. The density of settlement was varied using different brood rates. The data collected during two successive summer generations (1995-96, 1996-97) revealed significant differences in the density as well as population size, due to different brood rates. Differential mortality was observed, depending on the density of settlement. Analysis of pooled data revealed a significant positive correlation (r=0.53) between the surviving insects and proportion of males (**Fig.1**). Analysis of variance of sex ratio revealed significant differences ($P<0.05$) among the treatments.

The cream mutant line is being multiplied and crossbred for obtaining desirable recombinant lines.

A number of experimental lines of *rangeeni*, *kusmi* and trivoltine race are being maintained on potted *bhalia* plants for the breeding programme. The life cycle behaviour of trivoltine race is being studied under Ranchi conditions in this host. The insects of the generation starting from the first week of October did not complete their life cycle till the end of March, as against the normal time in 1st-2nd week of February.

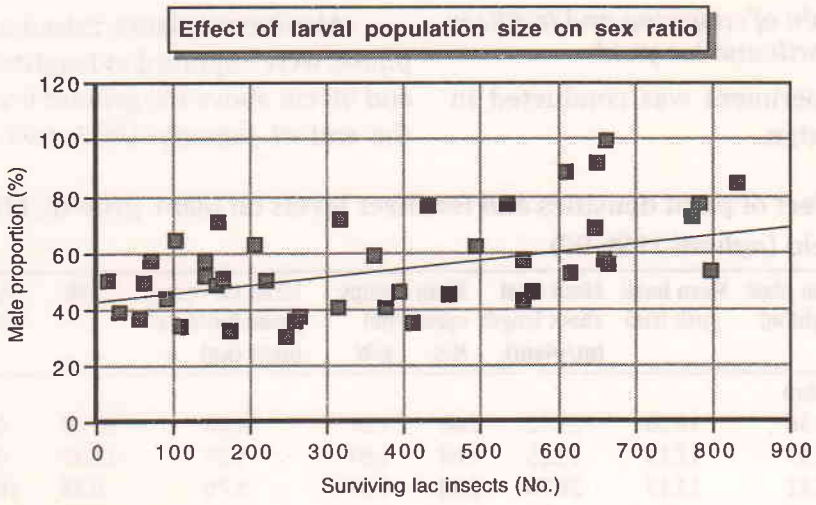
Study of inbred lines of *rangeeni* lac insect has not revealed any inbreeding depression for the biological characters. Intra and interline differences for resin productivity are being evaluated for a linecrossing programme for productivity improvement.

2.1 Propagation and Management of Lac Host

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

(B.P.Singh, P.Kumar, S.C.Srivastava, S.G.Choudhary and S.Ghosal)

The project aims at developing a suitable technique for rapid raising of *akashmani* (*Acacia auriculaeformis*) plantation under rainfed condition by maximising the growth of plants for *kusmi* lac cultivation.



Effect of plant density and fertilizer on plant growth and lac yield

An experiment was laid out in split-plot design with three replications. The treatments consisted of three plant densities in the main plot and four fertiliser levels in sub-plot(*Ann. Rep. 1995-96*). Observations recorded on plant growth attributes before raising of lac crop (*aghani*,1996-97), harvested green biomass and stick lac yield of the lac crop are given in **Table 19**. The differences in the plant growth attributes were not significant due to different plant geometry.

The LIR (light interception ratio) data clearly indicated that the plant densities influenced significantly the intercepted radiant energy. LIR decreased significantly with wider spacing but reverse was true in case of total harvested green biomass. *Akashmani* plants raised in first phase were put under lac culture, 2 years after transplanting to raise *aghani* 1996-97 lac crop. The lac yield data in Table 19 show that the extent of yield increase at 4.0x3.6m was 50.6 (90.5%) and 13.3 (14.3%) g/ plant over 2.0 x 1.8 m and 3.0 x 2.7m spacings respectively.

Significant improvement in plant growth characters (except plant height) were observed over control by the application of fertilizers at different levels. Maximum basal plant girth, total shoot length, canopy spread and harvested green biomass in the treatment plot applied with 50gN + 100 gP_2O_5+ 20gK_2O per plant and were found to be statistically significant . The LIR was found to increase significantly with the increase in fertilizer levels. The sticklac yield, in general, was low probably due to incessant rains after inoculation and also due to initial exploitation of unpruned plants. However, there was an increase in yield with the increase in fertilizer levels. A dose of 75g N + 150g P_2O_5 + 30 g K_2O per plant proved to be superior producing 84.2, 35.7 and 28.5 % more yield in stick lac over control and other two fertilizers levels respectively.

Effect of height of coppicing and fertilizer on plant growth and lac yield

The experiment was conducted in split-plot design.

Akashmani plants, raised in the first phase, were coppiced at heights of 30, 60 and 90 cm above the ground level during the end of January 1997, two and half

Table 19 Effect of plant densities and fertilizer levels on plant growth, LIR and lac yield (*aghani* 1996-97)

Treatments	Mean plant height(m)	Mean basal girth (cm)	Mean total shoot length (m/plant)	Mean canopy spread (m) N-S	E-W	Mean harvested green biomass/ plant (Kg)	LIR	Sticklac yield/plant (g)
Plant geometry (m)								
2.0x1.8	2.56	16.06	23.52	2.60	1.91	4.98	63.42	55.94
3.0x2.7	2.59	17.15	23.25	2.68	1.94	5.22	11.97	93.26
4.0x3.6	2.51	15.15	20.76	2.49	1.99	5.70	6.28	106.58
CD at 5%	NS	NS	NS	NS	NS	NS	19.73	NS
Fertilizer levels (g / plant)								
$N + P_2O_5 + K_2O$								
0 + 0 + 0	2.50	13.49	19.21	1.78	1.82	2.98	16.18	60.55
25 + 50 + 10	2.53	15.64	21.14	1.87	1.89	5.72	22.87	82.17
50 + 100+ 20	2.67	18.14	25.85	2.05	2.09	6.34	34.44	86.77
75 + 150+ 30	2.52	17.14	23.83	2.06	2.01	6.16	35.40	111.55
CD at 5%	NS	1.75	4.54	0.25	0.18	2.17	13.75	29.82

Table 20 Effect of fertilizer levels on the growth of *akashmani*

Fertilizer levels(g/plant)	Mean plant height (m)	Mean basal girth (cm)	Mean total shoot length(cm)	Canopy spread (m) N-S	E-W
$N + P_2O_5 + K_2O$					
0 + 0 + 0	3.22	18.81	59.50	2.32	2.22
30 + 40 + 20	3.59	23.82	74.31	2.62	2.52
60 + 80 + 40	3.57	24.32	80.21	2.60	2.62
120+160 + 80	3.49	24.19	76.57	2.65	2.64
CD at 5%	0.186	1.767	5.562	0.173	0.074

Table 21 Effect of fertilizer levels on dry wt. of stems, leaves & root and number of nodules

Fertilizer level (g/plant)	Mean dry wt. (g/plant) stem	leaves	root	No.of nodules/ plant
$N + P_2O_5 + K_2O$				
0 + 0 + 0	80.50	68.87	31.87	117.8
30+ 40 +20	110.25	69.42	42.75	186.0
60+ 80 +40	119.87	88.75	47.95	216.0
120+160+80	128.25	91.12	62.37	195.0

years after transplanting, to convert them into bushes. Plant growth attributes recorded before coppicing were found to be significantly influenced by the level of fertilizer application. The maximum plant height, basal plant girth and total shoot length was achieved by the application of 60g N + 80g P_2O_5 + 40g K_2O per plant, whereas canopy spread was maximum by 120g N + 160g P_2O_5 + 80 g K_2O per plant **Table 20.**

Recording of dry matter of different components was done one year after planting of *akashmani* plants. Roots, stems and leaves were separated and dried till the constant weights were obtained and the dry weight of individual plant parts were recorded. Perusal of data (**Table 21**) indicated that the maximum dry weight of stems, leaves and roots was found at the highest rate of 120N + 160P_2O_5 + 80 K_2Og per plant whereas maximum number of nodules per plant was recorded with 60N + 80P_2O_5 + 40K_2Og per plant.

2.1.14 Organogenesis and improvement of *kusum* (*Schleichera oleosa*)

(S.C.Srivastava and P.Kumar)

In vitro development of tissue segments of *kusum* was studied using culture media incorporating M.S. + varying concentrations of 2,4-D at 25 ± 2 °C.

The host plant materials used were axillary buds from air-layered branches(more than three years old) as well as segments of seed cotyledons. The seed cotyledons of *kusum* in M.S. medium with 8 ppm 2,4-D showed maximum callus development (38.9 %) during May - September '96. Further, lac host plant materials like *ber*, (*Zizyphus mauritiana*) and *galwang*, (*Albizzia lucida*) were also included during Nov - Dec '96 as per the recommendation of D.R.C. (Nov'96). Maximum callus development in *galwang* was observed at 8-10 ppm of auxin, whereas for *ber* it was with 6 ppm (**Table 22**).

Table 22 Callus development in the cultures of lac hosts in M.S.medium with Auxin (2, 4-D)

Treatment	Callus(%) from seed cotyledons of *kusum*				Callus(%) from seed cotyledons of *galwang*		Callus(%) from seeds of *ber*	
2,4-D(ppm)	123DAI From May	60DAI From Aug.	23DAI From Sept.	131DAI From Sept.	69DAI From Dec.	60DAI From Jan.	49DAI From Dec.	75DAI From Jan.
2.0	22.2	4.2	4.2	4.2	Nil	12.5	Nil	25.0
4.0	11.1	4.2	20.8	Nil	Nil	25.0	Nil	Nil
6.0	27.8	Nil	12.5	Nil	Nil	12.5	50.0	23.0
8.0	38.9	Nil	12.5	4.2	16.7	25.0	16.7	Nil
10.0	16.6	4.2	12.5	12.5	16.7	28.6	Nil	Nil

DAI= Days after inoculation

None of the *kusum* plant materials (axillary and apical buds and seed cotyledons) formed callus during Oct-Jan.96-97.

Table 23 Plant growth attributes of germplasm of *Flemingia* spp. prior to lac inoculation

Treatment (Accession No.)	Plant Height (cm)	No.of Shoots per bush	No.of inoculable shoots/ bush	Length of Inoculable shoots/bush(cm)	Wt. of biomass per bush (kg)
ICPW-192(*F.bracteata*)	47.5	29.3	13.2	136.3	2.21
ICPW-193(*F.macrophylla*)	95.8	24.3	11.2	279.3	0.95
ICPW-194(*F.macrophylla*)	118.9	26.4	12.2	317.2	1.02
ICPW-196(*F.macrophylla*)	125.8	22.1	13.1	374.2	1.51
ICPW-198(*F.macrophylla*)	117.5	25.0	12.4	376.5	1.22
ICPW-200(*F.paniculata*)	104.3	22.8	11.2	349.0	1.49
ICPW-201(*F.semialata*)	101.2	13.0	10.7	366.0	2.09
ICPW-202(*F.stricta*)	137.5	34.6	22.4	481.2	2.44
ICPW-203 (*F.strobilifera*)	46.0	25.1	8.5	151.4	0.56
ICPW-204(*F.strobilifera*)	53.2	60.2	29.0	252.6	4.24
SEm ±	7.13	5.26	2.87	24.41	0.26
CD at 5%	20.61	15.21	8.30	70.57	0.76
σ^2g	1100.07	128.50	42.71	10545.77	1.08
σ^2p	1301.87	238.50	75.34	12911.87	1.36
GCV	34.99	40.03	45.13	33.23	60.10
PCV	38.06	45.53	59.94	36.77	67.33
h^2%	84.49	53.88	56.68	81.67	79.66
Genetic gain	62.81	17.14	10.13	191.18	1.91
GA (% over mean)	66.25	60.53	69.99	61.87	110.51

- Transformed arc sin values

Table 24 Lac yield potential of *Flemingia* spp.

Treatment (Accession No.)	Initial Mortality (%) #	Sex ratio (F %)#	No.of lac bearing shoots/bush	Length of lac bearing shoots/bush(cm)	Weight of brood per bush (kg)	Scraped lac yield/plant(g)
ICPW-192(*F.bracteata*)	40.0	78.7	8.9	34.6	0.200	5.3
ICPW-193(*F.macrophylla*)	45.9	61.3	10.1	139.6	0.313	15.6
ICPW-194(*F.macrophylla*)	38.6	63.9	11.7	170.0	0.301	24.5
ICPW-196(*F.macrophylla*)	43.2	74.3	11.2	228.8	0.570	27.0
ICPW-198(*F.macrophylla*)	38.3	38.3	10.7	141.8	0.361	19.9
ICPW-200(*F.paniculata*)	33.3	69.6	9.1	174.9	0.361	22.6
ICPW-201(*F.semialata*)	31.6	67.2	11.5	170.3	0.319	175.8
ICPW-202(*F.stricta*)	44.8	72.9	16.4	197.8	1.092	49.3
ICPW-203 (*F.strobilifera*)	29.8	49.9	9.4	25.9	0.000	0.0
ICPW-204(*F.strobilifera*)	44.10	74.80	9.6	24.9	0.043	1.7
SEm ±	5.58	6.66	1.20	38.82	0.21	7.17
CD at 5%	NS	NS	3.5	112.7	0.615	20.82
σ^2g	7.24	21.00	3.38	4133.23	0.058	2635.16
σ^2p	110.52	198.67	9.16	10168.37	0.238	2841.17
GCV	6.87	6.76	16.86	49.11	61.640	149.89
PCV	26.94	20.79	27.75	77.03	125.010	155.74
h^2%	6.55	10.57	36.93	40.64	24.320	92.75
Genetic gain	1.42	3.07	2.30	84.44	0.244	101.84
GA (% over mean)	3.64	4.53	21.11	64.50	62.61	297.53

- Transformed arc sin values

Efforts to overcome the problem of browning of the culture medium were not successful.

2.2 Genetics and breeding of lac host plants

2.2.7 Survey, collection, maintenance, evaluation and characterization of different lac host germplasms

(P.Kumar, S.C.Srivastava, S.K.Jaipuriar, S.Ghosal and B.P.Singh)

Evaluation of different germlines

To estimate the performance of ten germlines of *Flemingia* species, 6 month old shoots were inoculated with *kusmi* lac in July @ 100g per bush. The experiment was laid out in a Randomised Block Design with four replications. Different growth parameters of the hosts, lac yield and yield attributes were recorded.

Tables 23 and **24** incorporate the data on growth attributes of different germplasms of *Flemingia* sp. before inoculation and lac yield attributes and lac yield respectively. Growth of the plants continued even after inoculation, almost in all cases.

Before inoculation: Height of plant ranged from 46 cm in ICPW-203 (*F. strobilifera*) to 137.5 cm. in ICPW- 202 (*F. stricta*) and total number of shoots ranged from 13.0 in ICPW-201 *F.semialata* to 60.2 in ICPW - 204 (*F. strobilifera*). In both the parameters ICPW-202, 198, 196 and 194 germlines were at par. Number of inoculable shoots were very high in ICPW-204 while it was a par among the rest. Considering mean value of inoculable shoot length, ICPW-194, 196, 198, 200 and 201 were at par to each other, but ICPW-202 recorded the highest and ICPW-192 recorded the lowest values.

After inoculation : Number of lac bearing shoots per bush was observed maximum in ICPW-202 and minimum in ICPW-192 while the same values for length of lac bearing shoots were observed in ICPW-196 and 204 respectively.

Length of initial settlement and length of lac bearing shoots per bush showed quite high values for many germlines, but yield wise they could not show good performance except ICPW-201.

Yield

ICPW-201 yielded maximum brood lac per bush and were also at par with ICPW-202 and ICPW-196. Performance of the rest germlines was not satisfactory.

ICPW-204 and 203 yielded highest and least biomass respectively.

Effect of nitrogen rate and plant spacing on growth and lac yield of F.semialata

Three levels of nitrogen in two split doses each (0, 6 and 12 g per bush) and three levels of spacing (60 x 50, 80 x 50 and 100 x 50 cm) were combined to get 9 treatment combinations and each was replicated thrice following Randomised Block Design. Plants transplanted in August 1995 were inoculated with broodlac @ 50 g per bush in July 1996 and the crop was harvested in Feb.1997. Data pertaining to growth parameters of plant as well as lac insect were recorded from time to time; lac

yield and yield attributes were also recorded (**Table 25**).

Plant height and number of inoculable shoots were significantly influenced during the early period of growth. Number of leaves per bush was not significantly influenced due to N application. However, all the growth parameters showed an increasing trend of values with increased levels of nitrogen application. Height and total branches per bush increased throughout the growth period but the number of inoculable shoots per bush did not increase beyond 450 DAT. Senescence started after November. As a result, total number of leaves decreased drastically after 450 DAT.

Application of nitrogenous fertilizer promotes the vegetative growth of plants. Thus the plots with higher levels of nitrogen exhibited lower flowering response, but the difference was not significant.

In the early period of growth, wider spacing resulted in greater height.

However, other growth characters like branches, leaves and inoculable shoots were not affected by spacing. The length of encrustation, the cell weight and sex ratio were not significantly influenced, due to levels of nitrogen (**Table 26**). Narrow spacing resulting in higher plant density created humid atmosphere around the plants. Fungal infestation occurred on the lac insects,

Table 25 Effect of different levels of nitrogen and spacing on growth of *Flemingia semialata* during *aghani* 1996-97 lac crop season

Variable	Height(cm)				Branches/Bush (No.)				Leaves/Bush (No.)				Inoculable shoots/bush (No.)
	300DAT	375DAT	450DAT	525DAT	300DAT	375DAT	450DAT	525DAT	300DAT	375DAT	450DAT	525DAT	300DAT
N0	77.04	118.48	165.20	174.40	7.04	6.99	6.50	6.82	8.33	39.37	46.70	23.24	4.51
N1	83.67	131.60	179.10	190.00	7.60	6.81	6.71	7.76	8.68	41.71	48.51	25.11	4.90
N2	90.15	137.10	190.30	187.00	7.33	8.29	8.32	8.46	9.55	48.48	59.74	29.90	5.63
S.Em. ±	1.60	3.61	5.11	6.30	0.31	0.53	0.37	0.73	1.10	2.95	2.49	3.08	0.24
C.D.at 5%	4.81	10.85	15.33	NS	NS	NS	1.12	NS	NS	NS	NS	NS	0.72
S1	82.85	131.40	184.50	191.36	7.12	7.40	6.85	9.11	41.60	48.76	24.66	4.52	6.14
S2	82.50	131.80	187.30	189.37	7.32	7.55	7.74	7.85	8.84	45.52	57.43	26.46	5.66
S3	85.48	123.90	162.70	172.25	7.33	7.14	6.93	7.86	8.62	42.45	48.75	27.12	4.86
SEm ±	1.60	3.61	5.11	6.30	0.31	0.53	0.37	0.37	1.10	2.95	2.49	3.08	0.24
C.D.at 5%	NS	NS	15.33	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.72

DAT - Days after transplanting

Table 26 Mean values of growth attributes of lac insect during fertilizer cum spacing trial for *aghani* 1996-97 lac crop

Variable	Weight of cell(mg)						percentage of females	Length of encrustation per bush (cm)	
	70 DAI	90 DAI	110 DAI	130 DAI	150 DAI	170 DAI		107 DAI	187 DAI
N0	4.75	20.63	44.93	51.12	57.00	53.10	72.22	221.1	128.56
N1	5.03	21.06	43.36	49.63	59.70	61.30	74.77	161.4	111.27
N2	4.60	21.54	42.04	47.42	56.15	47.10	74.71	202.9	123.22
SEm ±	0.32	1.12	3.02	6.27	4.74	3.37	1.37	16.6	12.26
C.D.at 5%	NS	NS	NS	NS	NS	10.11	NS	NS	NS
S1	4.76	20.55	38.94	50.03	57.01	53.90	73.53	174.3	91.20
S2	4.27	21.45	49.03	55.32	60.48	49.70	37.67	230.9	141.85
S3	5.34	21.14	42.36	42.55	55.35	57.90	74.50	180.3	130.01
SEm ±	0.32	1.12	3.02	6.27	4.74	3.37	1.37	16.6	12.26
C.D.at 5%	NS	NS	NS	NS	NS	NS	NS	NS	36.76

N0- No urea
N1- Urea: 6 g/plant
N2- Urea:12 g/plant

S1- 60 x 50 cm
S2- 80 x 50 cm
S3-100 x 50 cm

Table 27 Efect of nitrogen rates and spacing on yield and yield attributes of *Flemingia semialata* (*aghani* 1996 - 97)

Variable	Brood (q/ha)	Weight of rejected plant portion (q/ha)	Scraped yield per plant (g)	Scraped lac yield (q/ha)
N0	38.46	192.03	153.8	9.6
N1	31.09	197.70	122.5	7.5
N2	38.43	232.62	154.0	9.8
S.Em.±	3.26	23.25	12.12	0.97
C.D. 5%	NS	NS	NS	NS
S1	37.21	251.4	111.6	9.9
S2	35.02	211.57	140.0	8.6
S3	35.75	259.45	178.7	8.3
S.Em.±	3.26	23.25	12.12	0.97
C.D.5%	-	69.73	36.34	-

lead to reduced encrustation length in the later stage.

Brood yield, weight of rejected plant parts and scraped lac yield per plant were not influenced by levels of nitrogen (**Table 27**). There appeared to be a increasing trend of weight of rejected plant parts with increasing levels of nitrogen. The uniform brood rate was probably not sufficient for the higher shoot area at higher fertilizer levels.

Brood yield per ha did not vary significantly due to spacing. However, yield per plant varied significantly. Weight of rejected plant parts (q/ha)did not show much variation due to spacing. Abundance of diseases in lower spacings rules out the possibility to utilize the higher biomass to produce lac in lower spacings.

Loosening of lac encrustations became more pronounced after December. No significant differences among the means was observed either at different levels of nitrogen or the spacings due to much variability in data.

Ad hoc studies

1. Life period pattern of trivoltine lac insect

(Y. D. Mishra and A. Bhattacharya)

A study was undertaken to study the life period of recently discovered trivoltine lac insect after change in their locality of occurrence from tropical eastern coastal plain(West Bengal) to sub-tropical eastern plateau of Chotanagpur, Ranchi.

The mean life period of trivoltine lac insects recorded during summer, rainy and winter seasons was found to be 122, 97 and 150 days at the native place of occurrence and 125, 100 and 199 days at the new locality (Ranchi) respectively. The insect has completed three generations in exactly one year at its native locality whereas it could only complete 2.6 generations during the same period at the new locality.

2. Comparative evaluation *kusmi* early and late varieties

(Y. D. Mishra and A. Bhattacharya)

The *kusmi* early variety of lac insect was compared for performance of its broodlac yield on *kusum* with *kusmi* late variety during *aghani* 1996-97 and *jethwi* 1996 crop seasons.

An experiment was laid out at Hesal Field Area in RBD with 4 treatments and 8 replicates. Lac crops were raised during *aghani* and *jethwi* seasons . Weight of lac encrustations of early and late varieties during *jethwi* (300 g/m and 240 g/m respectively) was found to be significantly higher than that obtained during *aghani* season (170 g/m and 150 g/m respectively. The weight per metre lac encrustation of early variety during *jethwi* season was also found significantly higher ($p<0.01$) than that recorded in case of late variety in the same season, however, it was not so during *aghani* crop season.

DIVISION OF LAC PROCESSING AND PRODUCT DEVELOPMENT

Researches Completed

3.2.15 Synthesis of isoambrettolide/ exaltone and plant growth regulators from aleuritic acid

(R.N. Majee, N. Prasad, I. Rajendran, V.K. Rao and S.C. Agarwal)

Synthesis of Isoambrettolide

- The yield of isoambrettolide (a compound used in the perfumery industry) was reported to be 58% last year. During the period under report, the yield of isoambrettolide was increased to 72% by modifying the reaction conditions as described below:

  Aleuritic acid, on treatment with ethylorthoformate/ benzoic acid followed by saponification yielded 16-hydroxy-9-hexadecenoic acid (96%) which was polymerised in the presence of *p*-toluene sulphonic acid and toluene. The polymer obtained was deploymerised *in vacuo* in presence of $MgCl_2.6H_2O$ to give isoambrettolide.

- Isoambrettolide was also prepared in overall 30% yield by treatment of aleuritic acid with methyl orthoformate/MeOH/PPT to afford the polymer which on pyrolysis with Ac_2O gave the acetoxy methyl-enoic acid quantitatively. This was distilled *in vacuo* with glycerol/KOH to yield the title compound. The structure was confirmed by PMR and mass spectra. The compound had musk-like odour.

- A new method (single step) was developed for the synthesis of isoambrettolide. This involved treatment of aleuritic acid with ethyl orthoformate/ benzoic acid to obtain polymer directly which was then depolymerised with $MgCl_2.6H_2O$ to obtain isoambrettolide in 47 percent yield. The compound was compared with authentic sample of isoambrettolide (CO-TLC and IR). The characterisation of the product is in progress.

Synthesis of dilactone

A dilactone, 1,4 dioxa-2,3dioxo-6-cyclopentadecene having musk-like odour was synthesised from 2-undecene-1,11-diol obtained from azelaic acid aldehyde (one of the periodate oxidation products of aleuritic acid) by treatment with diethyl oxalate followed by distillation with $MgCl_2.6H_2O$ *in vacuo* to obtain the product as a liquid. The mass and PMR spectra revealed the formation of the above compound.

Synthesis of exaltone

Exaltone (cyclopentadecenone, m.p. 62-63°C) was obtained from aleuritic acid by a method, different from that reported earlier involving six steps in an overall 25% yield. This compound is also a perfumery compound of commercial importance. The

reaction sequence was as follows :

Acetonide of aleuritic acid on $KMnO_4$ oxidation yielded 9, 10-dihydroxy-1,16-hexadecadioic acid which was oxidised with NBS/EtOAc to obtain 9, 10-dioxo-diacid. It was then reduced by Wolff-Kishner reaction to give hexadecane-1, 16-dioic acid (thapsic acid). Its dimethyl ester was subjected to Dieckmann condensation followed by acid hydrolysis resulting in the title compound. IR:1744 cm^{-1} (C = O)

Synthesis of plant growth regulators

Two analogues of PG regulators, i) methyl 9-methyl sulphonyloxy 2-nonenoate and ii) 10-carboxy methyl-2-decenoic acid were synthesised from 7-hydroxy heptanal and 9-oxo-nonanoic acid respectively adopting simple reaction sequences.

- 7-Hydroxyheptanal (one of the periodate oxidation products of aleuritic acid) on condensation with malonic acid in the presence of dry pyridine gave 9-hydroxy-2-nonenoic acid, which on methylation followed by mesylation with MeOH/H+ and $MeSO_2Cl$ afforded methyl 9-methyl sulphonyloxy-2-nonenoate.
- 9-oxo-nonenoic acid, the other oxidation product of aleuritic acid on methylation with diazomethane gave methyl ester which on condensation with malonic acid in the presence of pyridine afforded 10-carboxy-methyl-2-decenoic acid. The above analogues were characterised by PMR and mass spectra.

3.4.7 Modification of by-product obtained during preparation of aleuritic acid and its use in surface coatings

(A.K. Das Gupta and R.N. Majee)

The mother liquor, obtained after filtration of sodium aleuritate during preparation of aleuritic acid from lac, is a by-product. It was acidified to get a gummy mass, washed with water and dried. During washing a considerable loss in the yield of gummy mass was noticed.

A solution of the gummy mass was made in denatured spirit and was then modified with 20% and 40% (on wt. of gummy mass) BIOMINE (Butylated melamine resin) alongwith *p*-toluene sulphonic acid. The properties of air-dried and baked films prepared from the modified varnish are described in the **Table 28.**

Table 28 Properties of baked and air-dried films obtained from modified gummy mass varnish

Characteristics	Baked films	Air-dried films
Finish	Smooth,uniform and non-tacky	Smooth,uniform and non-tacky
Water resistance	6h	45 min
Acid resistance	90 min	15 min
Alkali resistance	2h	30 min
Flexibility	Fails	Passes
Acetone resistance	Passes	Passes
Alcohol resistance	Passes	Passes
Gloss (On standard black glass)	60%	65%

A method was developed to separate sodium chloride present in the mother liquor. The yield of gummy mass obtained

after separation of NaCl was found not to reduce during repeated washing with water unlike the method described above.

The gummy mass when reacted with ethylene glycol for 20 h at 164°C and thereafter it was heated at 200°C for 2.5 h to remove the unreacted ethylene glycol. A brown mass was obtained which was cooled at room temperature and treated with T.N. Shellac for 5 min at 160°C. When this product was cooled at room temperature, a flexible black compound was obtained which was soluble in ethyl alcohol and n-butanol. Films prepared from the solution in ethyl alcohol/ denatured spirit were found smooth, uniform and passed the test of flexibility. This varnish may find application for wooden surface.

3.5.6 Slow-release lac-based pesticidal systems

(B.C. Srivastava and A.K. Jaiswal)

Sub-project : Slow-release lac-based multilayered/monolithic pesticidal system for cockroach control

Multilayered laminated pesticidal system

It was found that waste hydrolysed gummy mass obtained during isolation of aleuritic acid may serve as a suitable matrix for the slow-release of chlorpyrifos pesticide. Bio-studies of a suitable composition prepared revealed that the hydrolysed gummy mass induces the desired slow-release action of the chlorpyrifos (*B. germanica*) for an extended period (*Ann.Rep. 1993-94*).

Monolithic pesticidal system

It consists of chlorpyrifos as an active pesticide and shellac/bleached lac as 'matrix'. Bio-evaluation of the developed composition indicated that the system is sufficiently active to control cockroach (*B. germanica*) for a long duration of time, reducing the need of multiple application under normal condition.

Sub-project: Slow-release lac based mosquito larvicide formulation

Studies were undertaken to develop lac/by-product based slow-release environmentally safer formulation for efficient control of mosquito larvae in their breeding habitats for an extended period. Optimum conditions for the lab scale preparation of carrier in tab/cake form based on lac and its by-products namely *kiri* and *molamma*, with and without filler were worked out and characteristics of the product studied. Bio-study of the formulation was undertaken, the LC_{20} to LC_{99} and LT_{20} to LT_{90} values for the mosquito larvae reared in lab were determined. Results indicated slow-release action of the formulation *(Ann. Rep. 1995-96)*.

Studies were also undertaken to see the effect of fillers/extenders on release of the active ingredient. Different sets of larvicide formulations based on *molamma* as 'matrix' and $CaCO_3$ as an extender and chlorpyrifos as an active pesticide in cake/tab form were prepared and their physical parameters namely, diameter and thickness noted. These were bio-assayed (**Table 29**). It was found

Table 29 Percentage mortality of mosquito larvae exposed with *molamma*-based pesticidal formulation with varying quantity of filler ($CaCO_3$)

Quantity of filler $CaCO_3$ (mg)/ 2g of *molamma*	Total no. of larvae exposed	Percentage mortality			
		Time after exposure			
		2 h	3 h	4 h	5 h
100	63	9	41	90	100
125	54	15	63	93	100
150	54	18	54	89	100
175	89	7	30	55	100
200	78	11	67	86	100
225	73	10	44	90	100
300	56	7	71	82	100
400	59	7	58	73	100
500	62	18	84	94	100
600	63	21	69	84	100
700	79	8	62	82	100
1000	77	17	87	95	100

that there was no significant differences in mortality of the mosquito larvae with different quantities of filers tried. The samples were again bio-assayed after six months of application. The activity of the formulation was found to reduce significantly indicating that the pesticide was released at the initial stage only.

Studies were also undertaken for the preparation of formulation in granular form. Blank granules using *molamma* as matrix, $CaCO_3$ as an extender and PVA as binder were prepared manually. Their dispersion and breaking strength were studied. It was observed that the drying at an elevated temperature and for longer duration improved the dispersion of granules in water as well as their breaking strength. Granules were also prepared and dried at different temperatures with the help of fluidized bed drier. It was observed that dried granules remained intact in water, the breeding habitat of mosquito larvae.

3.6.5 Development of lac-based insulating materials/ varnishes having improved electrical properties

(D.N. Goswami and P.M. Patil)

The work was initiated with an objective to develop shellac - based insulating material possessing improved properties for utilisation in the electrical industries. Studies were made on the changes in the electrical properties of blends of solutions of shellac with polyvinylacetate and polyvinylacetal resin, separately.

Shellac-polyvinylacetate resin

Dielectric strength of blends was higher (44-58 kV/ mm) compared to that of the component resins (40 kV/mm) indicating improved electrical insulating strength. Tracking index of blends (186-260 V) was also higher compared to that of the polymer (174 V) indicating

improved resistance towards degradation under electric stress, in presence of moisture, electrolyte etc. Shellac also improved humidity resistance of the polymer. Baking of the films of certain blends for a specific baking schedule provided thermal resistance upto 115°C whereas, the component resins failed the test.The above results suggest the possibility of use of shellac as an extender for the polymer.

Shellac-polyvinylacetal resin

Blends of shellac with three types of polyvinylacetal resin yielded higher dielectric strength (66-72 kV/mm) and tracking index (266-300 V) compared to those of shellac films. One of the polymers improved resistance to humidity of shellac; baking of the films led to further improvement in the resistance, as revealed by the dielectric strength measurement of films exposed to 100% R.H. Presence of a cellulosic compound and a plasticiser in the shellac-polymer blend raised the dielectric strength further (83-90 kV/mm) and also improved resistance to humidity. Plasticisers improved flexibility of films.

Films of blends after certain baking schedule showed thermal resistance upto 165°C, whereas the component resins separately failed the test after similar treatment. D.S.C. thermograms of blends revealed complicated nature. Presence of small exotherms in between endotherms indicated that there might be some localised regions of compatibility. Measurement of dissipation factor and capacitance of blends of solutions was made at 100 kHz upto 21 days after blending. Very little decrease was noticed in the above parameters for some blends with time. This suggested that there might be some possibility of close association of polar groups of the resins. For shellac and the polyvinylacetate resin, however, no decrease in the above parameters was noticed. Tan δ value of films (0.0004) cast from certain shellac-polyvinylacetal resin blends was also lower than that of shellac (0.003) corroborating the above.

Films prepared from polyvinylacetal resin solution containing shellac upto 20 parts remained flexible. Films possessed adequate dielectric strength and tracking resistance even these were baked at 120°C for 48 h, indicating possibility of use of shellac as an extender for the polymer.

Pigmented varnish

Two lac-based red pigmented varnish (air-drying type) compositions were developed. Films obtained from the varnishes after baking at 200°C for 3-4 h resulted darkening. Seven pigments were tried and one pigment was selected which resulted minimum colour change. Dielectric properties were not affected by the use of different pigments used.

The properties of the varnishes were found to be superior compared to those of an imported varnish reportedly being used in Chittaranjan Locomotives Works especially, with regard to dielectric strength, tracking resistance and resistance to transformer oil.

Evaluation

Varnish composition based on shellac-polyvinylacetal resin was found to be satisfactory when applied on the coils of ceiling fans and 1 H.P. motors of the institute and on 3,5 H.P. motors by a local consumer. Samples were also supplied to several consumers for evaluation at their shops.

Blends of shellac with two more resins

Air-dried films obtained from blends of shellac and butylated melamine formaldehyde exhibited thermal resistance upto 100°C and high dielectric strength (80 kV/mm.). The varnish, however, failed the test for resistance to tracking as per IS:10026-1982. Attempt was made to improve upon this property by addition of epoxy resin. Although both shellac and epoxy resin are known to posses anti-tracking property, films obtained from blends of shellac-butylated melamine formaldehyde-epoxy resin passed marginally the test for resistance to tracking as per IS:10026-1982.

Preliminary study was made on the tracking property of blends of shellac and another thermoplastic resin (a polyetherimide). Solutions of both were made in *m*-cresol. Tracking index of the polymer is 160 V. The blend, however, passed the test at 200 V as per IS:10026-1982, indicating an improvement in the tracking property of the polymer by shellac.

Conclusions

Shellac when used in requisite quantities in the alcoholic solutions of polyvinylacetate and polyvinylacetal resin imparts some useful properties without affecting most of the properties of the polymers.Thus shellac may be used as an extender for the polymers.

Blend of shellac and polyvinylacetal resin in solution stage can be used as a general purpose air-drying type anti-tracking insulating varnish/lacquer. Keeping quality of the varnish is good and does not gel even when stored for more than a year under normal room temperature condition.

5.7 Investigation on degradation of lac on ageing and methods for controlling the same

Sub-project: Studies on mechanism of degradation of lac on ageing

(S. K. Saha)

Poor storage stability of lac resin resulting in loss of fluidity and solubility after prolonged storage is seen as a serious problem affecting use of the resin in various industries. The search for a suitable method to stop or delay the degradation of useful properties of lac during storage is hampered by the complexity of the mechanism by which the resin polymerises during storage. The initial objective was to study the mechanism involved in the polymerisation of lac on ageing complemented by a study of an effective inhibitor of the polymerisation process.

Earlier, the major parameters which define the state of polymerisation of lac were found out and the effect of sunlight on these parameters were studied for a large number of samples stored upto 24

months. Based on the results of these studies, it was postulated that degradation of properties of lac on ageing is due to two separate reactions, namely (i) photoactive free radical polymerisation via formation of hydroperoxide and (ii) a secondary non-photochemical reaction between hydroxyl groups of two or more lac molecules. The following reaction scheme was also suggested for the photoinitiated free radical polymerisation of lac.

$RH + O_2$ (lac) ——> $\dot{R} + H\dot{O}O$ (slow)

$\dot{R} + O_2$ ——> $R O\dot{O}$

$RO_2 + R\text{-}H$ ——> $ROOH + \dot{R}$

$ROOH$ ——> $R\dot{O}, R\dot{O}_2, H\dot{O}$

$RH + \dot{R}$ ——> $R\text{-}\dot{R}H$

$H\dot{O}O + H\dot{O}O$ ——> $O_2 + H_2O_2$

$2H_2O_2$ ——> $O_2 + 2H_2O$

$ROOH$ ——> Stable products

Since sun's u.v. radiation is responsible for the photochemical reaction, it is expected that the decomposition rate will be faster if lac is subjected to condensed u.v. radiation. Experiments were conducted by keeping lac in a u.v. chamber maintained at ambient temperature. Samples were drawn after incremental periods of storage and tested for flow, heat polymerisation time (HPT) and hot alcohol insolubles. A control was also maintained. The results are shown in **Table 30**. It was observed that lac sample exposed to u.v. radiation showed faster decrease in flow and H.P.T. compared to the control thereby confirming the photoinitiated oxidation of lac leading to formation of hydroperoxide, which rapidly breaks down into radicals facilitating free radical polymerisation of lac.

Six selected antioxidants were assessed for their possible role in inhibiting the polymerisation. They were separately incorporated into shellac in varying proportions by melt mixing, under identical conditions. Shellac samples thus treated were stored under ambient conditions and tested for flow, heat polymerisation time and hot alcohol insolubles. It was found that out of six antioxidants tried, three were effective in retaining higher flow and H.P.T. thereby stabilising the properties to a considerable extent. The results are presented in Table 30.

The results indicate that lac polymerises on ageing in different ways from heat polymerisation and that certain antioxidants have important role in controling the polymerisation of lac on storage.

Sub-Project: Improvement in storage life of lac at various states

(P. C. Gupta and R. Singh)

The deterioration of lac depends on several factors such as method of storage,humidity, temperature etc. An attempt was made to improve the storage life of lac by the use of small quantities of sodium acetate and triethanolamine (which prevent polymerisation of lac molecule).

In *Ann. Rep.* 1994 - 95 (p 28) & 1995 - 96 (p 37-38), the effect of addition of sodium acetate and triethanolamine at various concentrations have been reported on the cold alcohol solubility

Table 30 Change in quality parameters of shellac with ageing under different treatments

Expt. No.	Sample	Condition of storage	Period of storage (months)	Quality parameters		
				Flow (mm)	Heat polymerisation time (min.)	Hot alchol insol. (%)
1.	Shellac (original)	ambient	0	80	60	0.66
			6	55	44	-
			12	41	40	-
			18	33	39	-
			24	30	33	1.8
2.	Shellac (original)	U.V. Chamber	0	80	60	0.66
			6	54	54	-
			12	36	36	-
			18	26	34	-
			24	20	26	1.78
3.	Shellac (treated) control for expts.4,5,6	ambient	0	70	48	0.77
			6	55	45	-
			12	40	42	-
			18	35	40	-
			24	32	38	1.92
4.	Shellac+ antioxidant A	ambient	0	82	62	0.87
			6	62	55	-
			12	53	47	-
			18	50	48	-
			24	50	44	1.43
5.	Shellac + antioxident B	ambient	0	80	62	0.93
			6	63	55	-
			12	53	50	-
			18	50	43	-
			24	50	43	1.42
6.	Shellac + antioxident C	ambient	0	75	51	0.85
			6	50	48	-
			12	41	40	-
			18	33	35	-
			24	31	32	1.51

and heat polymerisation time (HPT) of shellac upto 15 months storage. Observations made during the period showed that the cold alcohol solubility remained the same with and without retarders. The HPT was also same to that of control upto 12 months. But a significant decrease in the value was observed in control from 15 month. However, retarder treated samples showed improvement compared to that of control. Further studies upto 29 months storage indicated that retarders improved the cold alcohol solubility and HPT as compared to control. The data are given in **Table 31**.

Table 31 Cold alcohol solubility and HPT with and without retarders

Retarders	Characteristics	Storage period (Month)	Percentage of retarders on the weight of shellac 0	0.05	0.10	0.20	0.40
Sodium acetate	Cold alcohol solubility(%)	0	95.10	-	-	-	-
		15	95.16	94.15	95.62	95.3	95.65
		25	90.86	94.56	94.10	94.25	95.54
		29	90.20	96.00	-	94.55	95.86
	Heat polymerisation time (min)	0	52	-	-	-	-
		15	35	37	40	43	42
		25	36	-	-	42	46
		29	36	-	41	43	46
Triethanol-amine	Cold alcohol solubility %	0	15.1	-	-	-	-
		15	95.15	93.77	94.49	-	-
		25	90.86	93.42	94.20	94.56	95.20
		29	90.20	95.55	-	94.46	93.61
	Heat polymeri-sation time(min)	0	52	-	-	-	-
		15	35	39	36	38	39
		25	36	42	43	44	45
		29	36	43	-	46	44

Researches in Progress

3.3 Modification of shellac/ constituents and their utilisation

3.3.14 Improvement in the method of preparation of lac dye and aleuritic acid

(N. Prasad, K.M. Prasad and V.K. Rao)

Lac dye

Preparation of calcium salt of lac dye from sticklac wash-water using calcium hydroxide and technical grade lac dye from the calcium salt of dye was repeated adopting the optimised conditions of pH for precipitation and decomposition. Experiments were then carried out to prepare pure lac dye from its technical grade by crystallisation from aqueous solution by controlled concentration under vacuum. The optimisation of conditions for its crystallisation for maximum recovery of pure lac dye is in progress.

Aleuritic acid

Researches were carried out for recovery of aleuritic acid from *kiri* - a major and cheap by-product of lac industry which contains approximately 30% resin, following the method of caustic soda hydrolysis. The method was found unsatisfactory and the aleuritic acid obtained was also of poor quality. Therefore, hydrolysis of *kiri* with calcium hydroxide was attempted in different lots for recovery of aleuritic acid which gave promising results. The method has been

improved and standardised by optimising the conditions of hydrolysis with calcium hydroxide, decomposition with acid and finally precipitation of aleuritic acid. This has resulted recovery of pure aleuritic acid, m.p. 98-99°C, in an average yield of 11% on the weight of resin content in *kiri*. The method thus optimised has the advantage of easy adaptability and economical compared to the caustic soda method. The method has a direct impact on profitable utilisation of *kiri*, a by-product of lac industry.

Ad hoc Study

Development of economical water and heat resistant shellac varnish for wooden furniture

P C Gupta and P M Patil

A water and heat resistant shellac varnish, based on dewaxed lac and butylated melamine resin in alcoholic medium, was developed earlier. In this formulation butylated melamine resin was 40% on the weight of shellac and therefore cost of the composition was high. It is, therefore, proposed to economise the composition so that it may compete in the market.

During the period, the cheaply available chemicals viz., urea and thiourea were chosen as these react with aldehydic group of shellac similar to that of melamine. Shellac varnish was prepared in alcohol and treated with these chemicals separately in different proportions i.e., 2,3, and 5 per cent on the weight of shellac and left over night for chemical reactions. Film properties of these varnishes, such as water and heat resistance, scratch hardness and flexibility were studied adopting standard methods. The data are given in **Table 32.**

From the above data, it is observed that water resistance and scratch hardness are fairly good as compared to control with 3% of reactants. The heat resistance was, however, found unsatisfactory in all cases. Regular shellac contains about five percent wax m.p. of which is lower than 100°C and there is also no chance of the wax undergoing any chemical reaction with urea and thiourea. Hence, regular shellac was replaced by dewaxed shellac and varnish was prepared containing three per cent reactant on the weight of shellac separately and film properties were studied. The data are presented in **Table 33.**

The results of the study suggest that water and heat resistant shellac varnish may be prepared for wooden furniture by incorporating urea/thiourea in dewaxed shellac varnish. Present formulation is much cheaper and may compete with commercial samples.

Table 32 Film properties of regular shellac varnish with urea and thiourea

Added chemical on the wt. of shellac in varnish (%)		Water resistance	Heat resistance (99°C) on wooden polished panel	Scratch hardness (g)	Flexibility over 3mm mandrel
Urea	0	Blushes	Fails	900	Cracks
	2	Did not blush upto 72 h	do	1100	Passes
	3	Did not blush more than a week	do	1900	do
	5	-do-	do	1800	do
Thiourea	2	Did not blush upto 72 h	do	1600	do
	3	Did not blush more than a week	do	1500	do
	5	-do-	do	1000	do

Table 33 Film properties of dewaxed shellac varnish with urea and thiourea

Added chemical on the wt. of shellac in varnish (%)	Water resistance	Heat resistance (99°C) on wooden polished panel	Scratch hardness (g)	Flexibility over 3mm mandrel
0	Blushes	Fails	800	Cracks
3 (urea)	Did not blush for more than a week	Passes	1500	Passes
3 (thio urea)	-do-	-do-	1400	-do-

SUMMARY

DIVISION OF LAC PRODUCTION

Research Completed

1.1.9 To evolve suitable management practices for sustainable and profitable brood as well as sticklac production on *kusum*, field and laboratory experiments were conducted at Hesal experimental area and at the Institute. A new system of *kusmi* lac production has been recommended which consists of allowing one self inoculation in existing method of lac cultivation on *kusum*. The new system can be conveniently adjusted in five coupe / four coupe system as per availability of host plants. Models for estimating available area on *kusum* for crop inoculation and forecasting the yield have been developed.

For management of lepidopterous, neuropteran predators and fungal pathogens, chemical control schedule has been worked out for *aghani* and *jethwi* crops.

Researches in Progress

1.1.10 A correlation between pruned points and total resultant inoculable area of *akashmani* trees has been determined. The average shoot length per pruned point obtained eighteen months after pruning were, 4.9m, 5.2m and 4.5m, for the trees pruned in February, July and October, respectively.

The performance of *rangeeni* and *kusmi* brood lac. obtained from *akashmani*, on conventional hosts *palas* and *kusum* and vice-versa have been found to be satisfactory.*Akashmani* broodlac when used repeatedly on the same host resulted in gradual decrease in yield during successive years.

A suitable lac cultivation technique for *akashmani* in alternation with conventional hosts *palas* and *kusum* has been evolved. In this technique, a four coupe schedule has been recommended for both *rangeeni* and *kusmi* strains.

Two coupes of *akashmani* are used alternately for the rainy season crops (*katki/aghani*) and similarly, two coupes of *palas/kusum* for the summer crops (*baisakhi/jethwi*). Brood rate of 15-20g per metre shoot length is recommended.

1.1.12 The optimum brood requirement for raising rainy, summer and summer-cum-rainy season crops on *palas* are 15-20g/m, 10-15g/m and 10-15g/m shoot length respectively. On *ber*, during the same crop seasons, 15-20g/m, 10-15g/m and 5-10g/m shoots respectively are required. For harvesting increased *ari* lac from *ber*, 20g brood per metre shoot is required.

1.4.21 Whole body extract of lepidopterous predators indicated presence of active principle for attraction of parasitoids.Tryptophan, sprayed over lac colonies under field condition, exhibited attraction of adult *chrysopa* females for egg laying.

Lac colonies inoculated during different months showed significant differences in the incidence of various

predators and parasitoids. The early maturing *kusmi* variety inoculated during December 1996 showed total absence of predators.

Tetrastichus purpureus, *Coccophagus tschirchii* and *Tachardiaephagus tachardiae*, have been observed to be the parasitoids of pest *Pseudohypatopa pulverea* which occur on stored lac.

The egg parasitoid *Trichogramma pretiosum* successfully parasitized the eggs of *P. pulverea* under laboratory condition. Laboratory rearing technique of *Brachymeria tachardiae* on the pupae of alternate host *Corcyra cephalonica* has been standardized.

Brachycyrtus eublemmae, a recorded doubtful parasitoid of *E.amabilis* has been recorded for the first time from the pupae of *Chrysopa* species.

An exposure of UV light for 15 to 20 minutes has been found to inhibit hatching of 90% *E.amabilis* eggs. The study is of practical significance for developing adaptability of *T. pretiosum* to eggs of *E. amabilis*.

1.5.8 A total of twelve stocks of lac insects germplasm from different regions were maintained. Four *rangeeni*, one *kusmi* and a trivoltine race from coastal region of West Bengal (Amarsi, Midnapur), were evaluated for their different biological and industrial attributes for summer crops. The crimson lac insects from Mali Basantpur were found to be superior in respect of economic attributes.

1.5.13 F_1 progenies of crosses made between experimental lines were raised for resin colour improvement. Effect of population density and size of the settled larvae on the sex ratio of lac insects was studied. A positive correlation was found between the surviving insects and the proportion of males.The inbred, cream and trivoltine lines are being studied for different parameters.

2.1.13 Best plant growth attributes of *akasmani* were observed with the planting spacing of 3.0x2.7m. LIR decreased significantly with the wider spacing but in the case of total harvested green biomass, reverse was noted. A dose of 75 + 150 + 30 g/ plant of N + P_2O_5 + K_2O proved to be superior and produced 84.2, 35.7 and 28.5% more sticklac over control and other two fertilizer levels respectively. Plant growth attributes were significantly affected by different levels of fertilizer application.

2.1.14 Approaches for callus development with M.S.medium at different concentrations of auxin at 25±2°C with seeds, axillary buds of lac host species were tried *in vitro*. Highest callus development recorded amongst the lac host plants studied was to the tune of 50 % with 6 ppm. of 2,4-D in case of *ber* whereas 28.6 % and 25.0 % in case of *galwang* with 10 and 8 ppm of 2,4-D respectively.

2.2.7 Ten germlines of genus *Flemingia* procured from ICRISAT, Hyderabad were evaluated for their potential as lac host. Despite relatively inferior growth (habit) performances, ICPW-201 of *F. semialata* produced maximum sticklac yield per

bush. ICPW-202 and 196 also produced good crop.

Growth, biomass yield etc. of *F.semialata* were influenced by N application during early stages of growth. Similarly, plant spacing had significant influence on the height of plants, length of settlement of lac insect and yield per plant. However, cell weight had inverse relationship with different levels of nitrogen application did not affect the yield and yield attributes. The study also yielded information that loosening of encrustation from stem starts even before commencement of December.

Ad hoc studies

1. The trivoltine lac insect recorded in the coastal region of West Bengal completed three generations in exactly one year at its native locality but it completed only 2.6 generations under Ranchi conditions.

2. The early variety of *kusmi* lac insect produced significantly higher weight of lac encrustation per unit length compared to the late variety, especially during the *jethwi* crop season.

DIVISION OF LAC PROCESSING AND PRODUCT DEVELOPMENT

Researches Completed

3.2.15 The yield of isoambrettolide was increased from 58 to 72% by modified reaction conditions. It was also prepared by another method which gave only 30% yield. A new method was evolved for the synthesis of isoambrettolide from aleuritic acid with overall 47% yield. 4-dioxa-2,3 dioxo-cyclopentadec-6-ene, a dilactone having musk-like odour was also synthesised from azelaic acid aldehyde, one of the periodate oxidation products of aleuritic acid. Exaltone (cyclopentadecanone) was synthesised by a new route in 25% yield from aleuritic acid.

Two PG regulator analogues, methyl 9-methyl sulphonyloxy-2 nonenoate and 10-carboxy methyl-2-decenoic acid were synthesised and characterised by PMR and mass spectra.

3.4.7 Varnish compositions were developed from the by-product obtained during preparation of aleuritic acid for air-drying and baking type applications. A method has been developed for removal of inorganic matter i.e., sodium chloride from the above mentioned by-product. Another varnish composition was developed with the by-product obtained after removing the sodium chloride from gummy mass.

3.5.6 A slow-release multilayered laminated system based on gummy hydrolysed mass as a 'matrix' and chlorpyrifos as an active pesticide was developed for the control of cockroach (*B. germanica*). Bio-assay studies revealed desired slow-release action of the active pesticide.

Lac based slow-release 'monolithic' pesticidal dispensing system was also developed for the control of cockroach (B.germanica). The system consists of chlorpyrifos as an active pesticide and shellac/bleached lac as matrix. Bio-assay showed that the system is effective to

control cockroach for a long duration of time and there is no need of multiple applications.

Mosquito larvicide formulation system was prepared in the cake/tab form, based on lac by-product *molamma* as matrix and chlorpyrifos as an active pesticide to kill mosquito larvae. Prepared granular form of formulation based on *molamma* as matrix, calcium carbonate as extender/filler and PVA as binder.

3.6.5 Dielectric properties of blends of solutions of shellac separately with polyvinylacetate and polyvinylacetal resin were investigated. Dielectric strengths of blends were found to be higher compared to those of the component individual resins. Shellac improved resistance to tracking and humidity of polyvinylacetate resin. Polyvinylacetal resin led to an improvement in the overall properties of shellac. Indication has been obtained for possible use of shellac as an extender for the above polymers. Blends of shellac and polyvinylacetal resin in the solution stage can be used as general purpose air-drying type anti-tracking insulating varnish/lacquer.

5.7 Mechanism of degradation of lac on ageing was investigated. It was found that properties of lac like flow and heat polymerisation time deteriorate at a faster rate when exposed to u.v. radiation. The results confirmed that polymerisation of lac during storage under ambient conditions is due to photo-initiated oxidation leading to the formation of hydroperoxide. Incorporation of antioxidants helped stabilisation of the properties of lac to a considerable extent.

Researches in Progress

3.3.14 The method of preparation of lac dye (technical grade) from its calcium salt has been standardised.

The recovery of aleuritic acid from *kiri* — a by product of lac industry, using lime method has been optimised. The average yield of aleuritic acid, m.p. 98-99°C, was obtained 11% on the wt. of resin content in *kiri*.

Ad hoc Study

Film properties of shellac varnishes, modified with different proportions of urea and thiourea, have been investigated towards development of a water and heat resistant shellac varnish.

I C A R PROJECT: REVOLVING FUND SCHEME

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

(I) *Kusmi* broodlac production at Chakidih, Orissa

The Revolving fund scheme was started on November 1, 1996 at Chakidih, Orissa. About 750 *kusum* trees were acquired from the Forest Department of Orissa and the Institute of Forest Productivity. As the required quantity (800 kg) of broodlac was not available, only 150 selected *kusum* trees in coupe 'D' were inoculated during the months of December, 1996 and February 1997, with 370 kg broodlac procured from the Institute and market. During this period, 200 trees under coupe 'B' were also pruned for future inoculation. Spraying of insecticides was done as per schedule and crop was developing satisfactorily.

Inoculation details

Lac insect inoculated	Broodlac source	No. of trees	Qty(Kg)
Kusmi early	ILRI	90	210
Kusmi late	Jhalda	30	80
Kusmi late	ILRI	30	80

Financial Report

Fund received from ICAR		Rs 6,70,000
Short term deposit		Rs 5,00,000
Working capital	**Total**	**Rs 1,70,000**
Expenditure (Rs)		
Non-recurring		
Synthetic net, Secateur		2,415
Recurring		
i) Operational:		
Broodlac 370 kg		17,700
Insecticides		1,430
Labour		3,300
P.O.L.		2,203
ii) T.A.		2,368
iii) Miscellaneous		1,164
	Total	**28,165**
	Grand Total	**Rs 30,580**
Income		
Value of *phunki* sticklac (unsold) 147 kg:		**Rs 6,500**

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- *'Lakh utpadan ki adhunik tareeke* - (a book in Hindi) A digest of the talks delivered during second '*Radio Krishi Pathshala*' on lac, broadcast by A.I.R., Ranchi (64 pp)
- *Unnat vidhi se lakh ki kheti* (a booklet in Hindi) - compiled by A.K. Jaiswal, S.K. Saha and S.N. Sushil (16 pp)
- A schedule for tests at I.L.R.I. testing laboratory (a booklet, 8 pp)
- Package of practices for lac cultivation on mixed plantation of *bhalia* and *galwang* - by P.Kumar, B.P. Singh and S.C. Srivastava (a booklet, 8 pp)
- Quick-drying shellac based insulating varnishes - compiled by D.N. Goswami (a folder, 4 pp)
- Aleuritic acid - compiled by R.N. Majee, I. Rajendran, S.C. Agarwal and R. Ramani (a folder, 4 pp)
- I.L.R.I. Training Prospectus 1997 (a folder, 4 pp)
- *Bharatiya lakh anusandhan* - kisanon ki *sewa mein* (Revised edition) - compiled by A.K. Jaiswal, K.K. Sharma and R. Ramani (a folder, 4 pp)

Patents

Applied for provisional patents on the following :

* 'Slow - release lac based pesticidal formulation for the control of cockroach (*B.germanica*), B.C. Srivastava and A.K. Jaiswal
* 'Anti-tracking air-drying type shellac based insulating varnish, D.N. Goswami

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Singh, B.P., '*Eaise kare jharidar poudhe mein lakh ki kheti*' in *Aaryavart*, 28 Dec., 1996

TRANSFER OF TECHNOLOGY

Training

The Division of Transfer of Technology conducts short - and long-term training programmes on lac culture, processing and products based on lac with the active co-operation of other Divisions and Sections of the institute.

The institute conducts certificate course on Improved Methods of Lac Cultivation (6 months). One person successfully completed the course during April-Sept. 1996 session. In order to bring about an improvement in the participation in the above course, it was revised and the period reduced to three months. During Oct. -Dec. 1996 session, five unemployed youths successfully completed the course.

The institute also conducts one-day and one-week training programmes on lac, with special emphasis on lac culture. These programmes mainly aim at educating the lac cultivators and others on the improved lac cultivation techniques. A summary of the above programmes conducted during the period is furnished in **Table 1**. The number of participants in the one-day and one-week programmes was 43 and 16 percent higher than the previous year, respectively.

Keeping in mind the demand from the farmers for "On-farm training," a number training camps on lac culture were organised in association with various NGO's as given in **Table 2**.

As a part of the Entrepreneurs' Development Programme for lac, demonstrations were arranged for preparation of aleuritic acid, dewaxed bleached lac and shellac gasket compound to various entrepreneurs (**Table 3**).

Launching of training programme for lac growers of Bihar and West Bengal at the Institute, under the sponsorship of Trifed, Ranchi

Table 1 Details of one-day and on-week training programmes related to lac culture conducted during 1996-97

Programme	Period	Beneficiary	Sponsoring organisation	No. of participants
Lac culture and other aspects	15-20.4.96	Farmers	Kerra Gramin Vikas Sangathan, Karra	3
	17-22.6.96	Farmers	Trifed, Ranchi	35
	24-29.6.96	Farmers	- do -	23
	- do -	Farmers	Biscolamf, Ranchi	12
	- do -	Farmers	Private	2
	11-16.11.96	Farmers	XISS, Ranchi	30
	2-7.12.96	Farmers	XISS, Ranchi	38
	10-15.2.97	Farmers	XISS, Ranchi	22
	10-15.2.97	Farmers	Private	5
			Total	**170**
Collaborative orientation programme on lac	26.4.96	Farmers	Divyayan KVK, Ranchi	40
	18.7.96	- do -	- do -	40
	6.9.96	- do -	- do -	50
	25.10.96	- do -	- do -	48
	1.2.97	- do -	- do -	40
	20.3.97	- do -	- do -	45
	11.10.96	- do -	KVK, R.K. Mission Kalyani, West Bengal	50
	6.1.97	- do -	Society of Rural Industrialisation, Ranchi	11
	15.1.97	- do -	Forest Department (West) Ranchi	45
	30.1.97	- do -	- do -	30
	7.11.96	- do -	Birsa Agricultural University, Ranchi	40
	6.9.96	Students	Ranchi Women's College, Ranchi	57
	8.10.96	Students	Xavier Institute of Social Service, Ranchi	64
			Total	**560**
Exposure programme on lac	1996-97	Farmers	Different organisations	1362

Table 2 Details of on-farm training conducted by the institute

Village	Block	Collaborating organisation	No. of Farmers participated
Vijaygiri	Tamar	XISS, Ranchi	49
Dolda	Murhu	XISS, Ranchi	103
Sarwada	Murhu	XISS, Ranchi	50
Kocho	Silli	Indian Aluminium Company, Chotamuri	54
Bisaria	Silli	Indian Aluminium Company, Chotamuri	34
Belgaon	Gumla	Sunita Kala Kendra, Gumla	47
Basudeocona	Raidih	Sunita Kala Kendra, Gumla	59
		Total	**396**

Table 3 Details of entrepreneur development programme on lac-based processes/ products during 1996-97

Process/Product	No. trained	Beneficiary	Period
Aleuritic Acid	4	Mr. Vivek Chokhany, Calcutta	10-26 July
		Mr. Rajeev Kr. Saw, Ranchi	7-24 August
		Mr. Raj Kr. Gupta Raipur	- do -
		Mr. Sandip agarwal, Purulia	- do -
Shellac Gasket Compound	1	Mr. Vivek Chokhany, Calcutta	16-24 July
Dewaxed Bleached Lac	2	Mr. Rajeev Kr. Saw, Ranchi	23 June - 3 Aug. '96
		Mr. Amit Kr. Jayaswal Raipur	18 Sep. - 5 Oct. '96

Agrotech 96 Exhibition at Patna
Hon. Minister for Agriculture Shri Chaturanan Mishra addressing the audience
A view of the stall on lac put up by the institute (below)

Technical Information Services

Technical informations, in respect of lac culture, lac process/product and other general information related to lac were provided to interested persons including the lac growers/entrepreneurs/ other agencies. More than 100 querries were attended to during the period. Lac culture samples received from lac growers and other organisations were examined for forecasting the time of crawler emergence and causes of lac insect mortality.

Exhibition, *Kisan Mela* etc.

The Institute regularly participated in various regional and national exhibitions and *Kisan Melas* by putting up stall depicting lac culture, processing and utilization as well as technologies available and the training programme of the Institute (**Table 4**).

Farmer Adoption

A farmer, Shri Raj Kumar Sahu of Jiravar village, Ormanjhi Block, Ranchi district was adopted for economic upliftment through lac cultivation. The adopted farmer, despite possessing a good number of *palas* trees had no prior experience or knowledge of lac cultivation techniques. After giving him training on lac cultivation techniques, a field demonstration of lac culture was

arranged on his *palas* trees. To start with, about 195 *palas* trees were inoculated in October, with *rangeeni* broodlac provided by the institute, to raise the *baisakhi* 1996-97 crop. The inoculation operations and subsequent *phunki* removal, pest control measures were carried out under the technical guidance of the institute. The crop was progressing well till the period under report. With this demons-tration, lac culture has been introduced in the locality. Further survey was taken up around this village for extending the TOT programmes in future.

Participation in 'Kisan Goshthi' etc.

Information dissemination on lac culture and lac-based cottage industry was done through lectures and an interaction session at a training camp (24-26 Feb., 1997) organised by IFFCO, Jamshedpur for 40 farmers of East and West Singhbum districts of Bihar. Experts of the institute also participated, on two occasions, in the

Table 4 Details of participation in exhibitions and *Kisan Melas*

Exhibition/ *Kisan Mela*	Date	Organiser	Location
Exhibition-Trng. Camp	4.10.96	Xavier Institute of Social Service Ranchi	Vijaygiri, Tamar block Ranchi dist.
- do -	10-11.10.96	- do -	Dolda, Murhu block Ranchi dist.
- do -	- do -	- do -	Sarwada, Murhu block Ranchi dist.
Indian International Trade Fair (Bihar Pavilion)	14-25.11.96	Trade Fair Authority of India, New Delhi	Pragati Maidan, New Delhi
Agro-Tech '96	18-27.12.96	IFFCO, New Delhi	Gandhi Maidan, Patna, Bihar
Exhibition-cum Training Camp	22.1.97	Indian Aluminium Company Ltd., Chotamuri	Kocho and Bisaria, Silli block, Ranchi dist.
Rural Exhibition	29.1.97	Canara Bank, Kamre Branch, Ranchi	Kamre, Ranchi
Annual Divyayan Kisan Mela 1997	6-7.2.97	Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi.	Demonstration Farm, Getalsud, Angara block, Ranchi dist.
Agri-Tech '97	12-15.3.97	The Bengal Chamber of Commerce and Industry in collaboration with Govt. of West Bengal	St. Paul's Cathedral Grounds, Calcutta

Lac expert informing the farmers about lac culture on akashmani *at the workshop organised by the Forest Dept. at Gumla (Bihar)*

'*Kisan Goshthis*' organised during the Annual '*Kisan Melas*' by Divyayan KVK, Ranchi and replied to querries of cultivators, regarding lac culture.

Experts from this institute delivered lectures on "Improved methods of lac cultivation" at a workshop on 'Forest Conservation and Forest Produce' held on 27.2.97 at Gumla. The workshop was attended by about 250 participants including lac cultivators and per-sonnel of Forest Department.

Field Demonstration

Two field demonstrations of pruning of *palas* trees of lac culture were organised at Kocho and Bisaria villages of Silli block, as a part of long term extension programme. Sixty-three farmers benefited from this programme.

On behalf of BISCOLAMF, Ranchi, 42 farmers belonging to Hardag, Kalamati and Fatehpur villages were supplied with quality broodlac for raising *kusmi* lac crop in their area. Follow up action was taken to evaluate the early *kusmi* variety. A team of experts visited the Fatehpur village and assessed the lac crop raised from broodlac supplied by the institute and advised them about the ways of utilizing this *kusmi* variety.

Survey of Lac Growing Areas

As a part of the survey programme for status of lac cultivation and potentials including socio-economic aspects, two post graduate students, Mr. Dhiraj K. Horo and Mr. Anthoni Bakhla of XISS, Ranchi were imparted organisational training on lac at the institute. They carried out a socio-economic survey of four villages in Murhu block in June '96. Thirty households were selected at random from each village. The data collected by them are being analysed.

The salient findings of the survey of Otong-ora village are summarised below:

Availability of host trees: The number of lac host trees available per household is 192 and the level of their exploitation is 37.4%. Of these, the break-up of only major hosts *palas*, *ber* and *kusum* is 86, 13 and 1% respectively.

Distribution of brood lac to farmers under the sponsorship of BISCOLAMF, Ranchi

Degree of exploitation : The survey revealed that 100% of *ber* trees, 37% of the *palas* trees are being exploited for lac culture. The exploitation of *kusum* and *pipal* trees is 7 and 77% respectively.

Income from lac culture: The average income per household from lac is Rs 10,500 per annum (1995). The relative contribution of lac derived from the exploited hosts is as follows :

Ber	53.2%
Palas	34.1%
Pipal	11.5%
Kusum	1.1%

The programme was executed under the Summer Placement Programme of Faculty of Rural Development, XISS, Ranchi for its students.

Linkages

The institute is in the process of establishing linkages with a number of organisations for taking up programmes to strengthen lac production and industry. A programme is being finalised for integrated rural development, incorporating lac culture, in a cluster of villages in collaboration with XISS, Ranchi. Similarly, linkages are being established with other agencies like Indalco, Chotamuri; Sunita Kala Kendra, Gumla and Small Industries Development Bank of India, Patna for various extension activities.

Publicity through Mass Media

Popularization of lac culture technique was also done through mass media. The radio talks delivered by the experts of the institute in the *Kheti bari* programme of at AIR, Ranchi have been furnished in **Table 5**.

Contest on the Radio *Krishi Pathshala* Programme

A contest was organised by AIR, Ranchi to listners of the second '*Radio*

Krishi Pathshala Programme' on lac, held during 4.10-27.12.95. A special prize distribution function was organised at the Institute on May 5, 1996 for the winners of the competition. Dr R. S. Paroda, Director-general, ICAR gave away the prizes to the winners. Prof. Gajendra Singh, DDG (Engg.) was also present on the occasion. A digest of various talks delivered during the above radio programme was compiled by the institute in the form of a book and released by DG on the occasion. A copy of the book and a certificate were sent

Dr R.S. Paroda, Director-General, ICAR and Secretary, DARE addressing the audience on the occasion of prize distribution ceremony of the second Radio Krishi Pathsala

Dr Paroda giving away the prizes, at the ceremony as Shri A. B. Pandey, Station Director (Offg.), AIR, Ranchi and Prof. Gajendra Singh, DDG (Engg.) looking on

to all the participants of the competition.

Various activities and functions of the institute were given wide publicity through local and regional news papers regularly to create mass awareness among the public about the role of the Institute. During the period, news items were published in different newspapers, on the Institute's activities.

Extension Literature

A number of publicity materials in the form of book, booklets and folders were prepared and published. These were:

- *Unnat vidhi se lakh ki kheti* - a booklet in Hindi.
- *Lakh utpadan ke adhunik tareeke* - a booklet in Hindi
- Schedule for Tests at ILRI Testing Laboratory - a booklet
- Package of practices for *kusmi* lac cultivation on mixed plantation of *bhalia* and *galwang* - a booklet
- Aleuritic acid - a folder
- Quick-drying Shellac-based Insulating varnish - a folder
- ILRI Training Prospectus - a folder
- *Bharatiya Lakh Anusandhan Sansthan* - Kisanon ki sewa mein (revised) - a folder.

Table 5 Radio talks delivered by the experts of the institute under the *Kheti Bari* programme of AIR, Ranchi

Topic	Date of Broadcast	Speaker
• *Lakh keet palan - Adhunik evam unnat tareeke*	21.4.96	Dr A. K. Jaiswal
• *Lakh Anusandhan Sansthan, Namkum, Ranchi ki upalabdhiyan*	24.8.96	Dr S. C. Agarwal
• *Lakh utpadakon ko sarkar ki ore se milne vali suvidhayen*	14.9.96	Sri R. Ramani
• *Lakh keet palan ke adhunik tareeke apnayen our adhik labh lein*	12.10.96	Dr A. K. Jaiswal
• *Jharkhand mein lah udyog*	11.11.96	Dr S. C. Agarwal
• *Lah utpadan ke vaigyanik evam adhunik tareeke*	11.1.97	Dr S. C. Agarwal
• *Lakh keet palakon ko sarkar se samay samay par milne vali suvidhayen*	22.3.97	Sri R. Ramani
• *Lakh keet palan ke poshak vriksha evam unki dekh rekh*	29.3.97	Dr A. K. Jaiswal

MISCELLANEA

IMPORTANT COMMITTEES

Research Advisory Committee

The Research Advisory Committee of the Institute, which was constituted in January, 1995 to suggest research programme based on National and Global context, in the thrust areas to review the research achievement of the Institute and to see that these are consistent with the mandate of the Institute. The third meeting of the RAC was held on 26-27th February, 1997.

The members of the committee are as follows

Dr AV Rama Rao Director, AV Rama Rao Research Foundation, Abra House, Hyderabad	Chairman
Dr S.C. Agarwal Director, ILRI, Ranchi	Member
Dr R.P. Kachru ADG (PE) ICAR, New Delhi	Member
Dr S.C. Pakrashi Ex-Director, IICB, Calcutta	Member
Dr R. M. Singh Prof., Dept. of Genetics & Plant Breeding, BHU, Varanasi	Member
Sri Roshan Lal Sharma Director, M/s Tajna Shellac Pvt.Ltd., Khunti, Ranchi	Member
Dr Ashok Kumar Singh AF-1 (C-5) Imlak Colony 11, Madesar, Varanasi	Member
Sri Shamsher Singh Verka, 94 The Mall, Amritsar, Punjab	Member
Dr S. K. Saha Pr. Scientist & Head, LP & PD Div., ILRI, Ranchi	Member - Secretary

Staff Research Council

Staff Research Council of the Institute was constituted following the guidelines received from the Council. The SRC meeting was held on 4-5 February, 1997 to review the progress and programme of various research projects.

Institute Management Committee

The 23rd meeting of Management Committee of ILRI was held on 28th November, 1996. The meeting was chaired by Dr S. C. Agarwal, Director and was attended by Dr R. P. Kachru, ADG, Sri S. S. Verka, Dr M. S. Haque, Director (Research), BAU, Ranchi, Dr S. K. Saha, Head Division of LP&PD, Dr A. Bhattacharya, Sr. Sc., Dr K. M. Prasad, Sr. Sc., Dr N. Prasad, Sr. Sc., Sri G. P. Sharma, F & AO, CIFRI, Barrackpore and Sri Rajeev Lal, AO.

Meeting of the Management Committee the Institute in progress

RAC members discussing with the farmers about the extension activities

SEMINAR, SYMPOSIUM ETC.

Organised by the Institute

National Seminar on Lac Industry-Challenges and Solutions

The Institute organised a National Seminar on 14-15 June, 1996 for bringing together, all concerned with lac to critically analyse the challenges of Indian Lac Industry and to work out an action plan for facing them. The theme of this seminar was "Role of lac in rural upliftment and entrepreneurs development" reflecting the ultimate thrust of the final policy. The two day seminar was organised at ILRI and attended by 120 delegates, which included farmers, industrialists, managers, policy makers, administrators, researchers, academicians, extension personnel and media persons from lac-based industries, ILRI, BISCOLAMF, TRIFED, KRIBHCO, SEPC, IFP, ZSI, XISS, Forest departments, BIT and other organisations. An industrial display of lac and lac products was also organised on this occasion. The seminar was co-sponsored by M/s BISCOLAMF, Ranchi and patronised by M/s Shellac Exports Association, Khunti (Murhu) and M/s Gupta Brothers, Bundu.

The seminar was inaugurated by Mr D. S. Mukhopadhaya, Regional Development Commissioner, Ranchi as the chief guest. Dr S.C. Agarwal, Director, ILRI presented an overview of the lac industry, covering all aspects, in his inaugural address. Mr Sudhir Tripathi, Registrar Co-operative Societies, Bihar gave a keynote address. Two booklets, viz., "Package of practices for *kusmi* lac cultivation on mixed plantation of *bhalia* and *galwang*" and "*Unnat vidhi se lakh ki kheti*" were also released on this occasion. Dr D.K. Banerjee, Ex-MD, BISCOLAMF, Ranchi, Mr R.K. Chaturvedi, M.D., BISCOLAMF, Ranchi, Mr B. Sahu, Member, Board of Governors, BISCOLAMF and Mr Roshan Lal Sharma, Tajna Shellac Factory, Khunti also addressed the seminar. Sixteen papers, on different aspects of lac were presented during the Technical Sessions I-IV. Open house discussion was held for the preparation of policy paper after elaborate deliberations, the recommendations were finalised. Sri B. Kapthuama, Director-General, Shrikrishna Administrative Institute, Ranchi chaired the concluding session to prepare the recommendations. At the end Sri R. Ramani, Convener and Head, Division of Transfer of Technology, ILRI proposed a vote of thanks.

The recommendations emerging out of the seminar have been sent to relevant organisations/departments/industries for follow-up action. The proceedings of this seminar has been published for circulation.

Objectives of the Seminar

* To identify the major problems facing lac industry today which need immediate attention and suggest solutions

* To evolve long-term future strategies for lac in the light of changing economic scenario and global demand
* To develop a protocol for establishing linkages between research organisations, GO's, NGO's, industry, cultivators and financing organisations for developing a stronger platform for lac industry
* To establish a centre of excellence in the country to provide information related to lac, covering all aspects.
* To prepare a policy paper on lac.

Technical Sessions

14.06.96

Session I : Lac cultivation : Problems, Technology Development and TOT aspects

Chairman : Dr R.K. Varshney, Addl. Director, ZSI, Calcutta

Rapporteurs : Dr K.K. Sharma & Dr S. Ghosal

Papers :

* Entomological research on lac outside ILRI in last two decades - Dr R.K. Varshney
* An up-to-date list of the lac insects of the world - Dr R.K. Varshney
* Advances in lac production technologies - Mr Y.D. Mishra *et al.*
* Transfer of technology programmes of ILRI on lac cultivation - Mr R. Ramani *et al.*
* Problems and prospect of lac cultivation using pigeon pea (*Cajanus cajan*) - Dr K.C. Mitra & T.K. Das.

Session II : Crop forecasting, marketing and financial aspects of lac cultivation

Chairman : Dr D.K. Banerjee, Ex-MD, BISCOLAMF, Ranchi

Rapporteurs : Dr A.K. Jaiswal & Dr B.S. Rayudu

Papers :

* The insecticide Thiodan (endosulfan) - A panacea in lac cultivation - Dr C.P. Malhotra
* Modelling and forecasting in lac - Dr A.K. Jaiswal
* Lac growers : Experience from the field - Fr. Beny Ekka
* What does the future hold for lac - Dr D.K. Banerjee
* Role of cooperatives in lac marketing - Mr R.K. Chaturvedi

15.06.1996

Session III & IV : Processing and product development: Problems, technology development, TOT to industries, marketing and financial aspects, quality control and consultancy

Chairman : Dr S.C. Agarwal, Director, ILRI & Dr S.P. Basu, Prof., BIT, Mesra, Ranchi

Rapporteurs : Dr D.N. Goswami & Mr V.K. Rao

Papers :

* An update of lac processing technology - Mr R.K. Banerjee

* Technology for the lac product sector - Dr S.K. Saha *et al.*
* Development of shellac as rocket fuel - Dr N.L. Munjal
* Preliminary studies on the antibacterial activity of lac dye - Dr S.P. Basu *et al.*
* Transfer of technology programmes of ILRI on lac utilisation - Mr R. Ramani *et al.*
* Dyeing of cotton with lac dye - Mr S. Saxena *et al.*

Session V : Open house discussion for preparation of policy paper

Chairman : Dr S.K. Saha, Head, LP & PD Div.,ILRI

Rapporteurs : Dr N. Prasad & Dr S.N. Sushil

Session VI : Presentation of recommendations and valedictory address

Chairman : Sri B. Kapthuama, Director General,Admn. Training Institute, Ranchi

Co-Chairman : Dr S.C. Agarwal, Director, ILRI

Rapporteurs : Mr R. Ramani & Dr K.K. Sharma

Vote of Thanks: Mr R. Ramani, Convener

Recommendations of the Seminar

RESEARCH AND DEVELOPMENT

Research on climatic and altitudinal zones for lac cultivation be conducted.

Research on lac insects of trivoltine race, those producing lesser colour resin and use of bushy hosts with other hosts be advanced.

A collection of living as well as dead lac insects be developed and maintained at ILRI.

A comparative study may be taken up on the quality of bleached lac from Thai and Indian lac.

Use of shellac in aerospace, pharmaceuticals and defence may be explored.

PROMOTION AND TRANSFER OF TECHNOLOGY

Extension programmes, through various media, should be intensified for promoting lac cultivation among the farmers, especially, tribals, in collaboration with GO's/NGO's etc.

The book : 'Lac cultivation in India',' Chemistry of Lac' and 'Uses of Lac' be updated and revised.

Colleges and Universities be involved to include lac culture in their syllabi.

Information regarding price, time and availability of broodlac and sticklac should be provided to the users through mass media.

Modalities of TOT activities of the institute should be given wider publicity.

Annual meeting should be conducted inviting all the organisations involved in lac for better coordination and cooperation.

A Quarterly newsletter may be published covering information on lac from all organisations.

Study on impact analysis of various training programme of ILRI should be conducted.

Lac industries should adopt villages for demonstration of improved methods of lac cultivation in collaboration with ILRI.

LAC PRODUCTION

Forest departments of various States and Union territories should be motivated to reintroduce lac culture in their forest zones.

Lac crop forecasting should be taken up on larger scale based on the findings of ILRI.

INDUSTRY

The LAMPS should take up the processing of sticklac. through small processing units.

Suitable steps should be taken with the concerned efforts of all agencies related to lac to assure stable price, assured quality and steady supply to, especially, foreign buyers.

Lac industries should take up cost-reduction exercise through better management and modernisation including prevention of processing losses.

Number of lac grades (refined, semi-refined) should be reduced to a minimum number, based on user requirements.

MARKETING AND FINANCE

TRIFED should take more active role in lac production and marketing sector and ensure reasonable price for lac growers.

Before arrival of the sticklac in the market, on the basis of forecast by ILRI, representative of TRIFED, BISCOLAMF, ILRI, growers and lac industries may fix a 'minimum support price' for sticklac, valid for one year.

Credit flow from banking and other financing sector to the lac growers should be increased with appropriate steps for creating awareness among the growers.

Steps must be taken to increase the domestic consumption of lac.

The institute should take up the problem of marketing of lac dye.

HRD AND POLICY

Collaboration and interaction of ILRI with organizations/departments in India/ abroad be encouraged. ILRI staff be also sent abroad and to other Indian Labs.

Proper environment should be created in lac cultivation sector to build up confidence and for involvement of lac growers, especially tribals.

Inter-state restriction on movements of lac/broodlac must be lifted.

Felling of lac host trees should be prevented through legal restrictions.

Revival of broodlac farms should be taken up with the help of forest department/state Govt. and other agencies under guidance of ILRI.

Lac grower should be provided with incentives and subsidies for lac cultivation.

Lac Industry - Challenges and Solutions
14-15 June, 1996

Shri D.S. Mukhopadhyay, I.A.S., RDC, Ranchi delivering his address at the inaugural ceremony
(Left to right : Shri R. K. Chaturvedi, MD, Biscolamf; Shri Sudhir Tripathi, I.A.S.; Shri D. S. Mukhopadhyay; Dr S. C. Agarwal, Director, ILRI)

Delegates of the seminar

Scientist presenting his paper at a technical session

Shri B. Kapthuama, Director-General, Shri Krishna Administrative Training Institute at the concluding session

Clear policy must be formulated for environmental pollution control of lac processing units.

NCDC & Central registrar should be asked to form a multistate cooperative society for marketing of lac.

Incentive should be provided for value-added products from lac.

A reasonable share of profit earned through lac should be contributed for R & D in order to enhance investment in this sector.

The ILRI should be developed as a national centre of excellence on lac for providing all kinds of information.

Attended by Dr S.C. Agarwal, Director

- National Seminar on "Eco-friendly Pathways to textile finishing and Agro-waste utilisation" held at Bombay on 1st March, 1997 organised by CIRCOT, Bombay.
- One day workshop on "Patent Awareness" held at Patna on 20th December, 1996 organised by Bihar Council of Science and Technology, Patna.
- National Workshop on "Enhancing Employment opportunities for rural women" held at CIAE, Bhopal on 28-29th May, 1996.
- Seminar at State Bank of India, Staff Training Centre on Bankable Projects/ Schemes on 6.11.96.

Attended by Scientists

- Dr B.P. Singh and Dr S.K. Jaipuriar, Senior Scientists of the Lac Production Division attended " Special Executive Development Programme Training under Advance Course on Management of Human Resources for Research at NAARM, Hyderabad during 18-30 November, 1996.
- Dr A. Jaiswal Scientist (Sr. Scale) of TOT Division attended Applied Zoological Research Association conference held at Hotel Ashok, Cuttack on 27-29th December, 1996. The theme of the conference was "Applied Zoological Research for Food Production and Environmental Safety."

TECHNICAL SERVICES

Library and Documentation Centre

The Centre houses a comprehensive collection of books, journals, reports and patent documents in the field of lac entomology, chemistry and cultivation. Its objective is collection, storage and dissemination of information as well as to maintain liaison with other national/ international organisations for exchange of information.

The library caters to the information needs of the scientists of the Institute and a number of research scholars from other academic institutions such as B.I.T. Mesra, Ranchi University, Ranchi, I.I.T. Kharagpur, NML & R.I.T. Jamshedpur, Universities of Patna, B.R. Ambedkar and Magadh.

Library Resources Development

The centre has the following holdings

Document	Additions during 1996-97	Total
Books/Bound vols.	817	23233
Annual Reports	204	2965
Reprints/Photocopies etc.	11	271
Bulletins, Res. Notes etc.	0	501

A sum of Rs 10.00 lakhs was spent on the procurement of the books, journals, microdocuments etc. during the period. Purchase of books/periodicals was made on the basis of G.O.C., New Delhi and ICAR guidlines. Most of the books/journals were procured from the publishers directly.

Library continued to maintain exchange of ILRI publications with many scientific institutions/libraries of the world.

Details of library acquisitions

Particulars	National	International
No. of journals subscribed	70	32
No. of journals obtained in exchange/gratis	52	27
No. of Research Institutions on mailing list (exchange)	127	17

National Union Catalogue

Library continued to be a contributing member of NUCSSI (National Union Catalogue of Scientific Services in India), a project, sponsored by the INSDOC, New Delhi.

To improve upon the existing services, a project proposal has been finalised towards computerisation of the centre and to establish bibliographical inhouse database on lac and shellac in the ninth 5 year plan. The centre aims to be the national centre in the first phase and the information database will be made accessible globally through internet homepage in future.

Computerization of the Library Services

Efforts are being made to procure the necessary hardware and software for computerisation of library services. In the first phase installation of CD-ROM drive alongwith an efficient Computer for scanning of AGRIS and AGRICOLA database will be taken up.

Reprography Services

A total of 10997 page xerox copies were prepared. A sum of Rs 2761 has been received against bill for the charges from the external readers. The section also provided lamination facilities for official work of Institute as well as for private work on payment basis.

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.

Material 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, compiled for onward transmission to the Council. Information on various matters/ activities related to the Institute were also supplied to a number of organisations on request. A Perspective Plan document of the Institute for the next 25 years was also compiled. The Cell also processed the research papers submitted for forwardal to scientific and popular journals.

Agricultural Research Information System (ARIS) Cell

An *ARIS* Cell was created in the Institute to house the local area network equipment and computers connecting all important offices including library. Creation of LAN is in progress and it has been designed ultimately to provide connectivity to the Desk Top of each scientist. Presently *ARIS* Cell is also connected with National Informatics Centre network through VSAT for Electronic Mail facilities.

Farm Unit

During the period under report the following activites were undertaken :

Management and upkeep of farm plantation including maintenance of roads, paths, channels, hedges and fencing were carried out. Hoeing, weeding and mulching operations were also carried out to the young lac host plants in different plots, unwanted and obnoxious weeds like *Lantana camera Stachyfarpheta indica* were uprooted from the *khair, palas, ber* plots manualy and from the *kusum, putri, ber* and *sandan* plots through frequent ploughing and turning over the soil between rows of lac host plants by tractor.

Necessary arrangement for security of farm, ploughing of experimental plots, transportation and irrigation works were arranged.

Seedlings of various species of lac host plants namely, *kusum, ber, galwang* and *bhalia* were raised in polythene bags and nursery beds for filling up the vacant space in respective plots, utilization in research experiments and distribution among the farmers/trainees.

Ploughing work were also done to

multiply foliage ornamental plants and roses. Seedlings of 25 varieties of seasonal flowers were also raised for planting under land scape unit.

For beautifying the landscaping area, seasonal flowers, shrubs and ornamental foliage plants were planted at different places in the institute. Rose plants were also planted in nursery area. Various operations like weeding, hoeing, spraying, spot irrigation, FYM and fertilizer application were carried out for proper maintenance of land-scaping area.

Farm Development Activities

* The low lying area was developed after making rises in plot no. 16.
* Planting of 400 *Acacia auriculiformis* (*Akashmani*), 130 *kusum*, 408 *ber*, 700 *palas* and 500 *khair* seedlings was carried out in different plots under gap filling programme.
* Obonoxious weeds were eradicated from the different plots, 75 nos. of dry and diseased unwanted trees and bushes were uprooted to improve the condition of plantation.
* Broodlac of *kusmi* and *rangeeni* was inoculated in *kusum*, *ber* and *palas* in model demonstration plots.
* Numbering of *kusum* trees in plot nos 40 to 46 were done.
* Applied lime with insecticide on the trunks of *kusum* trees for the control of termites.
* Five pits were prepared for keeping FYM and leaf mould.

The total return from the plantation through different farm produce, grass cutting charges, pruned twigs, firewood foliage and ornamental plants etc. was Rs 46,305.

Maintenance and Workshop Unit

The workshop unit continued to maintain electricity and water supply lines to the laboratories and the campus, including staff quarters, farm etc. Minor repairs of laboratory and farm equipments and fabrication of parts were also undertaken. Number of different jobs undertaken were : electrical, 1250; instrument repairing, 535; water supply/ pump repairs, 372; carpentry, 343; welding and steel fabrication, 242; Genset maintenance, 300. Besides the above, new electrical installation in the conference room and in the new pump house in the river bed were also done.

Art and Photography Unit

The Art and Photography Unit provided support for taking pictures of research materials and extension activities. Colour photographs and slides were taken of lac insects, associated insects, lac hosts, field experiments at the institute and in the field area. Photos of important meetings, events and visits of VIPs were also taken, which included visit of DG, ICAR; National Seminar on Lac Industry - Challenges and Solutions; Agrotech'96, Patna; *Kisan Mela*. This included 516 colour photographs and 36 colour slides.

AUXILIARY SERVICES

Official Language Unit

The unit continued to provide the following services :

* Holding meetings of the official language implementation committee and taking follow-up actions.
* Translation of office orders, circulars, memos, tenders, notices, quotations, Summary of Annual Report of the Institute etc.
* Nomination of non-Hindi speaking staff for Hindi training under the Hindi Teaching Scheme.
* Celebration of Hindi Day, Hindi Week; organising competitions in Hindi, Scientific Lectures in Hindi by Scientists of the Institute.
* Procurement of reference literature in Hindi.

Health Care Unit

A part-time Authorised Medical Attendant visits the Institute Dispensary to attend the medical needs of the staff and their dependants on the working days. He is supported by one Stockman-cum- Compounder, one Junior Clerk (part time) and an attendant. During the period, 4560 patents were attended to, 80 patients were referred to specialists at RMCH, Ranchi. Medical bills submitted by the staff members were also processed for reimbursement.

SPORTS

The Institute team, comprising of forty-two participants, Dr B.P. Singh (Senior Scientist) as Chief-de-Mission, Sri V.K. Singh and Sri K.K. Prasad as team managers, took part in the Zonal Inter-Institutional Tournament for Zone III, ICAR, Sport Meet 1996-97 at Central Inland Fisheries Research Institute, Barrackpore, West Bengal during 06- 11 January 1997.

VISITORS

The Institute houses a unique Lac Museum which provides information on various aspects of lac, viz., culture, processing and utilisation. The museum has always attracted visitors from all walks of life. During the period under report, about 2,590 persons visited the museum and gained experience about lac.

Some of the important visitors were:

Dr G.C. Srivastava, Chief Secretary, Goa

Dr R.S. Paroda, Director-General, ICAR and Secretary, DARE, Govt. of India, New Delhi

Mr Sudhir Tripathi, IAS, Registrar, Co-operative Societies, M/0 Co-operation, Govt. of Bihar

Mr R.K. Chaturvedi, M.D., BISCOLAMF, Ranchi

Mr D.S. Mukhopadhyay, IAS, R.D.S., Chotanagpur Division & Chairman BISCOLAMF, Ranchi

Smt S. Jalja, IAS, Secretary, M/o Co-operation Govt. of Bihar

Miss Sangita Singh, KRIBHCO, Indo British Rainfed Farming Project, Kanke Road, Ranchi

Scientist explaining about lac insects to a member of the study group from USA

Dr D.K. Banerjee, Ex. M.D., BISCOLAMF, Ranchi

Mr Vijai Sahu, Director, BISCOLAMF, Ranchi

Mr B. Kapthuama, IAS, D.G. (TRG) & Director S/C, PA Ranchi, Bihar

Mr J.S. Yadav, Director (Work), ICAR Krishi Bhavan, New Delhi

Dr B.S. Bisht, Project Co-ordinator, PHTS CIPHET, Ludhiana - 141004

Dr Nawab Ali, Project Co-ordinator, Soyabean Processing and Utilisation Centre, CIAE (ICAR), Bhopal

Sri A.K. Chaturvedi, IAS, Dy. Secretary, Krishi Bhavan, ICAR, New Delhi

Mr R.C. Sinha, C-12, IND. Area, Yamuna Nagar - 135 001 (Haryana)

Mr J.K.D. Garg, Chief Elect. Engineer, Northern Railway, Allahabad

Mr H.S. Gupta, I.F.S., D.F.O., Ranchi East

Prof. S.M.A. Rizvi, Director of Research, N.D. University of Agriculture, Kumarganj, Faizabad, U.P.

Dr A.K. Bhattacharya, ADG. (Engg.), ICAR Krishi Bhavan, New Delhi 110001

Dr Balendu Shekhar Tiwari, Professor, Department of Hindi, Ranchi University, Ranchi

Prof. V.A. Shenai, 13/91, Govandi Road, Chembur, Bombay - 71

Dr Jayaraj, ICAR National Professor, M.S. Swaminathan Research Foundation, Madras 600 113

Dr N.S. Rangaswami, Prof. of Botany, University of Delhi

Dr T.P. Sriharan, ADG (T.O.) (Retd.), ICAR, Hyderabad

Dr R.S. Rana, Director (Retd.), NBPGR, New Delhi

Prof N. Rama Krishna, Division of Entomology, IARI, New Delhi 110 012

Dr G.B. Singh, DDG, ICAR, New Delhi

Dr R.N. Prasad, ADG, (Soil), ICAR, New Delhi

Brig. & Mrs. R.S. Rawat, 61 Inf. Bde; 99 APO

Col. Bijai Singh 61 Inf. Bde., 99 APO

Col. R.K. Pawah, DDEME, HQMPBO, Area, Jabalpur, M.P.

Mrs V. Mohini Giri, Chairperson, National Commission for Women

Mr J. Singh, Director, CWDS, Bihar, 3/4 Baleshwari Bhavan, Karanibad, Deoghar, Bihar

Mrs Anubha Singh, Asstt. Manager, Small Industries,Bank of India, Patna, Bihar

Dr A.V. Rama Rao, Former Director, Indian Institute of Chemical Technology, Hyderabad - 500 007

Mr Jeanne Huber, Thisold House, New York, NY-10036, USA

Mr H.W. Galland, S D N Islip, New York, USA

PERSONNEL

(i) LIST OF PERSONNEL AS ON 31.03.1997

DIRECTOR

Dr S.C. Agarwal

DIVISION OF LAC PRODUCTION

Head of Division

Dr P. Kumar

Senior Scientist

Sri A.H. Naqvi (Agric. Entomol.)

Sri R.C. Mishra(Agric.Entomol.)

Dr B.P. Singh (Agronomy)

Dr S.K. Jaipuriar (Agric. Entomol.)

Dr A. Bhattacharya(Agric.Entomol.)

Sri S.C. Srivastava(Plant Breeding)

Scientist (S.G.)

Sri S.G. Chaudhary(Agric. Entomol.)

Scientist

Dr S.N. Sushil (Agric.Entomol.)

Dr S. Ghosal (Agronomy)

Field/Farm Technician

Sri M.L. Ravidas	(T-II-3)
Sri S.S. Prasad	(T-II-3)
Sri R.D. Pathak	(T-II-3)
Sri K.P. Gupta	(T-II-3)
Sri K.C. Jain	(T-I-3)
Sri K.K. Nagruar	(T-I-3)
Sri D.W. Runda	(T-2)
Sri R.G. Singh	(T-1)

Lab Technician

Sri D.D. Prasad	(T-II-3)
Sri S.K. Chatterjee	(T-II-3)
Sri G. Das	(T-I-3)
Sri R.K. Swansi	(T-I-3)
Sri Mohan Singh	(T-I-3)

Stenographer

Smt. S. Prasad

DIVISION OF LAC PROCESSING AND PRODUCT DEVELOPMENT

Head of Division

Dr S.K. Saha

Principal Scientist

Dr P.C. Gupta (Org. Chem.)

Senior Scientist

Dr D. N. Goswami (Physics)
Dr B.C. Srivastava(Org. Chem.)
Dr Niranjan Prasad (Org. Chem.)
Dr R.N. Majee (Org. Chem.)
Dr K.P. Sao (Physics)
Dr K.M. Prasad (Org. Chem.)

Scientist (Sr. Scale)

Sri P.M. Patil (Phys. Chem.)
Sri I. Rajendran (Org. Chem.)

Scientist

Sri P.C. Sarkar (Org. Chem.)
Sri V.K. Rao (Org. Chem.)
Sri D. Dhingra(Agric. Struc. Proc. Engg.)
Smt. S. Chopra (Elect. Engg.)

Technical Officer

Sri B.P. Banerjee	(T-5)
Sri D.D. Singh	(T-5)
Sri N.K. Dey	(T-5)
Sri T.K. Saha	(T-5)

Lab Technician

Sri Bhola Ram	(T-II-3)
Sri B.P. Ghosh	(T-II-3)
Sri Noas Minz	(T-II-3)
Sri M.K. Singh	(T-II-3)
Sri B.P. Keshri	(T-II-3)
Sri Tulsi Ram	(T-II-3)
Sri P.B. Sen	(T-I-3)
Smt. Prabha Devi	(T-I-3)
Sri H. Das	(T-1)
Sri R.K. Rai	(T-1)
Sri S. K.Tirkey	(T-1)
Sri Vinod Kumar	(T-1)

Stenographer

Sri A. K. Sinha

DIVISION OF TRANSFER OF TECHNOLOGY

Head of Division

Sri R. Ramani

Sr. Scientist

Dr A. Pandey (Phys. Chem.)

Scientist (SG)

Sri Y.D. Mishra (Agric. Entomol.)

Scientist (Sr. Scale)

Sri A.K. Das Gupta (Org. Chem.)
Sri R.K. Banerjee . (Org. Chem.)
Sri Radha Singh (Phys. Chem.)
Sri M.L. Bhagat (Agric. Entomol.)
Dr A.K. Jaiswal (Agric. Entomol.)
Dr K.K. Sharma (Agric. Entomol.)

Publicity Officer

Sri Lakhan Ram (T-6)

Technical Officer

Sri R.C. Maurya (T-5)
Sri L.C.N. Sahdeo (T-5)
Sri M. Ekka (T-5)
Sri K.K. Prasad (T-5)

Lab Technician

Sri U. Sahay (T-II-3)

Field/Farm Technician

Sri A.K. Sinha (T-II-3)
Sri R. L. Ram (T-II-3)
Sri S.B. Azad (T-2)

Artist-cum-Photographer

Sri R.P. Srivastava (T-II-3)

Museum Assistant

Smt. Ratna Sen (T-II-3)

Jr. Clerk

Sri R. K. Toppo

R.F.R.S., DHARAMJAIGARH (MP)

Station-in-Charge

Sr. Scientist (Agric. Entomol.) Vacant

Field/Farm Technician

Sri R.S. Malia (T-4)
Sri Jiwan Lal (T-I-3)

Lab Technician

Sri A. Hussain (T-II-3)

R.F.R.S., BALRAMPUR (W.B.)

Station-in-Charge

Sr. Scientist (Agric. Entomol.) Vacant

Field/Farm Technician

Sri S.K. Mukherjee (T-1)
Sri Satish Kumar (T-1)

R.F.R.S., JASHIPUR (ORISSA)

Scientist-in-Charge

Sri Y.D. Mishra (Agric.Entomol.)

Field /Farm Technician

Sri D.K. Singh (T-II-3)
Shri Madan Mohan (T-1)
Sri S.K. Tripathi (T-1)

HESAL EXPERIMENTAL BROODLAC FARM

Scientist-in-Charge

Dr K.K. Sharma (Agric.Entomol.)

Field/Farm Technician

Sri Binod Kumar (T-II-3)
Sri P.A. Ansari (T-2)

ADMINISTRATION

Administrative Officer

Vacant

Asst. Admin. Officer

Sri Nagendra Mahto

Sr Stenographer

Sri R. Rabidas (P.A. To Director)

Superintendent

Sri Md. Samiullah
Sri A.K. Chaudhury

Assistant

Sri R.B. Singh
Sri K.N. Sinha
Sri Ravishankar
Smt. Sati Guha

Senior Clerk

Sri K.L. Chaudhury
Sri Nurjan Topno
Sri Vijay Ram
Sri Baijnath Gope
Sri B.K. Rajak

Junior Clerk

Sri Narayan Gope
Sri Bihari Sahu
Sri S.C. Lal
Sri K.P. Arya
Sri A.K. Tripathi
Sri K.K. Deonath
Sri Samal Kumar

FINANCE AND ACCOUNTS SECTION

AFAO

Sri A.K.Lal .Hort.Stn (Part time)

Assistant

Sri Budhan Ram

Sr Clerk

Sri R.K. Upadhaya,
Sri Emil Gari
Sri Sudarshan Ram
Sri Thibu Minz
Sri Prahalad Singh

Jr Clerk

Sri Wilson Guria
Sri Raghunath Mahto

PURCHASE SECTION

In-charge

Sri Nagendra Mahto, AAO.

Assistant

Sri D. Ram

Jr Clerk

Sri Pranay Kumar

HINDI CELL

Assistant Director (O.&L.)

Sri Lakshmi Kant

Hindi Translator

Dr Anjesh Kumar

DIRECTOR'S CELL (A R I S Cell)

Technical Officer

Sri Ramesh Prasad	(T-5)
Sri A.K. Sahay	(T-5)
Sri D. Ganguli	(T-5)

Sr Clerk

Sri Anant Pandey

FARM UNIT

Technical Officer

Sri N.K. Sharma	(T-6)
Sri R.N. Vaidya	(T-5)

Field/Farm Technician

Sri H. Bhengra	(T-4)
Sri Md. A. Ansari	(T-II-3)
Sri V.K. Tiwari	(T-II-3)
Sri Sunil Mukherjee	(T-1)
Sri Satish Kumar	(T-1)

Tractor Driver

Sri M. Surin	(T-1-3)

LIBRARY

Technical Officer

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

Jr Clerk

Sri Arjun Gope

QUALITY CONTROL (TESTING LAB.)

Technical Officer

Sri D.Ghosh (T-5)
Sri K.M. Sinha (T-5)
Sri Jagdish Singh (T-5)

Lab Technician

Sri J.K. Ambuj (T-2)
Sri Ajay Kumar (T-1)
Sri Anup Kumar (T-1)
Sri Birendra Kr. Singh (T-1)

MAINTENANCE AND WORKSHOP UNIT

Technical Officer

Sri S.K.Srivastava (T-5)
Sri S.K. Bhaduri (T-5)

Instrument Mechanic

Sri H.L. Bhakta (T-II-3)

Assistant Mechanic

Sri I. Das (T-1)

Turner

Sri K. Tirkey (T-1)

Boiler Attendant

Sri B.L. Dey (T-II-3)

Carpenter

Sri Arjun Sharma (T-1)

Glass Blower

Sri B.S. Chaudhary (T-1)

Wireman

Sri R.K. Ravi (T-1)

CENTRAL STORE

Officer-in-charge

Dr K.M.Prasad, Sr.Sc.

Assistant

Sri K.D. Pandey

Sr Clerk

Sri Md. Mubarak

TRANSPORT

Driver

Sri Bandhan Runda (T-1-3)
Sri Jaswant Tiwari (T-1)
Sri Narayan Lakra (T-1)
Sri Arvind Kumar (T-1)

MEDICAL UNIT

Authorised Medical Attdt. (Part time)

Dr N.P. Sahu, M.D.

Stockman-cum-Compounder

Sri C. Pandey (T-II-3)

(ii) Appointments, postings, promotions etc. during the period

POSTING

	Designation	Date of Joining
Smt. S. Chopra	Scientist	2.9.96

APPOINTMENTS

	Appointed as	Date of Joining
Sri Inderdeo Das	T-1	4.6.96
Sri Vinod Kumar	T-1	4.6.96
Sri Madan Mohan	T-1	4.6.96
Sri Rajkumar Rai	T-1	4.6.96
Sri S.K. Tirkey	T-1	4.6.96
Sri S.K. Mukherjee	T-1	4.6.96
Sri S.K. Tripathi	T-1	5.6.96
Sri Satish Kumar	T-1	5.6.96
Sri Ajay Kumar	T-1	5.6.96
Sri B.K. Singh	T-1	5.6.96
Sri Anup Kumar	T-1	6.6.96
Sri Kunwar Tirkey	T-1	13.6.96

PROMOTIONS

	Promoted to	w.e.f.
Sri B.L. Dey (T-2)	T-1-3	1.1.84
Sri Maurice Ekka (T-4)	T-5	1.1.90
Sri K.K. Prasad (T-4)	T-5	1.1.91
Sri Jagdish Singh (T-4)	T-5	1.1.91
Sri P.A. Ansari (T-1)	T-2	1.1.91
Sri Bandhana Runda (T-2)	T-I-3	1.7.91
Sri Mohan Singh (T-2)	T-I-3	1.1.94
Sri K.A. Nagruar (T-2)	T-I-3	1.1.94
Sri Binod Kumar (T-2)	T-I-3	1.1.95
Sri Hiralal Bhakta (T-2)	T-I-3	1.1.95
Sri D. Ganguly (T-4)	T-5	10.3.95
Sri N. Mahto	Asst. Admn. Officer	1.11.96
Sri A.K. Chaudhury	Superintendent	1.11.96
Sri Sati Guha	Assistant	1.11.96

PLACEMENTS

Sri S.G. Chaudhary	Scientist (SG)	1.7.92
Sri Y.D. Mishra	Scientist (SG)	1.7.95
Dr. K.K. Sharma	Scientist Sr. Scale	20.3.94
Sri I. Rajendran	Scientist Sr. Scale	29.5.94
Sri B.P. Ghosh	T-II-3	1.1.95
Sri D.K. Singh	T-II-3	1.1.95
Sri A.K. Sinha	T-II-3	1.1.95
Sri R.P. Srivastava	T-II-3	1.1.95
Sri C. Pandey	T-II-3	1.1.95
Sri D.D. Prasad	T-II-3	1.1.95
Sri R.C. Singh	T-II-3	1.1.95
Sri R.D. Pathak	T-II-3	1.1.95
Sri R.L. Ram	T-II-3	1.1.95
Sri S.K. Chatterjee	T-II-3	1.1.95
Sri U. Sahay	T-II-3	1.1.95
Sri N. Minz	T-II-3	1.1.95
Sri B.P. Keshri	T-II-3	1.1.95
Sri M.K. Singh	T-II-3	1.1.95
Sri S.S. Prasad	T-II-3	1.1.95
Sri Tulsi Ram	T-II-3	1.1.95
Sri Ajmer Hussain	T-II-3	1.1.95
Sri K.P. Gupta	T-II-3	1.1.95
Sri K.C. Jain	T-II-3	1.1.95
Sri V.K. Tiwari	T-II-3	1.1.95
Sri Jaswant Tiwari	T-1	29.6.97
Sri Narayan Lakra	T-1	29.6.97
Sri Arvind Kumar	T-1	29.6.96
Sri Arjun Sharma	T-1	29.6.96
Sri Lakhan Naik	Lab. Attndt.	9.9.96
Sri Deodas Ram	Peon	9.9.96
Sri Gahna Oraon	Chowkidar	9.9.96
Sri Mahadeo Oraon	Helper	9.9.96
Sri B.P. Kujur	Lab. Attdt.	9.9.96
Smt. Balo Devi	Peon	9.9.96
Sri Budhu Sao	Lab. Attdt.	9.9.96
Sri Jairam Naik	Lab. Attdt.	9.9.96
Sri Md. Nayeem Ansari	Lab. Attdt.	9.9.96
Sri Dinu Ranjan Gorait	Cook Attdt. (Gust House)	9.9.96
Sri Bandi Lakra	Lab. Attdt.	9.9.96
Sri Bhola Gope	Lab. Attdt.	9.9.96
Sri Bandhu Mahto	Peon	9.9.96
Sri Jublal Mahto	Helper	4.10.96

TRANSFERS

Designation	Date	Place of transfer
Sri Rajeev Lal, Admn. Officer	17.1.97	from ILRI to NRCG,Junagarh
Dr B.S. Rayudu, Scientist	27.1.97	from ILRI to A.I.C.R.I.P. for Sorghum, Hyderabad
Sri A.K. Tripathi, Jr. Clerk	15.1.97	from ILRI to DWMC, Patna
Sri H.S. Munda, Asst. Admn. Officer	8.8.96	on promotion from ILRI, Ranchi to CHES, Ranchi
Sri D. Dhingra, Scientist	2.9.96	from CIAE, Bhopal to ILRI, Ranchi
Sri S. Mazumdar, Admn. Officer	10.2.96	from NRCG, Junagarh to ILRI, Ranchi
Dr K.P. Sao, Sr. Scientist	10.3.97	from NIRJAFT,Calcutta to ILRI, Ranchi

DISCHARGED

Sri S. Mazumdar, Admn. Officer	on 31.3.97

RETIREMENTS

	Designation	w.e.f.
Sri A. Haque	Assistant	31.7.96
Sri Gendu Bawri	S.G. III	30.6.96
Sri R.C. Singh	T-I-3	30.4.96
Sri Phekua Munda	S.G.	30.4.96
Sri H.N. Shukla	T-I-3	31.8.96
Sri M. Islam	T-5	30.11.96
Sri S.K.M. Tripathi	T-8	31.12.96

DEATHS

Sri G.M. Borkar	T-I-3	27.10.96
Sri H.R. Munda	T-I-3	7.11.96
Sri Nanku Oraon	Beldar	16.11.96

(iii) Category-wise breakup of number of employees and the number of Scheduled Castes and Scheduled Tribes amongst them as on 31.3.1997

Class of post	No. of posts sanctioned	No. of employees in position	No. of SC employees	No. of ST employees
Main Institute				
Scientific				
R.M.P. Scientist	1	1	-	-
Principal Scientist Sr. Scientist/ Scientist(SG) Scientist(Sr. Scale) Scientist	55	33	2	-
	56	34	2	-
Technical				
Category III			1	-
Category II	83	76	-	3
Category I			6	8
	83	76	7	11
Administrative				
Admn. Officer	1	-	-	-
Fin.& Accts. Officer	1	-	-	-
Asst.Admn. Officer	1	-	-	-
Asst. Director(OL)	1	1	-	-
Superintendent	3	2	1	-
Sr. Stenographer	1	1	1	-
Stenographer	3	2	-	1
Assistant	8	7	1	1
Sr. Clerk	14	12	1	3
Jr. Clerk	16	12	1	3
Hindi Translator	1	1	-	-
Security Officer	1	-	-	-
	51	39	5	8
Supporting				
Grade IV			3	1
Grade III	110	83	3	7
Grade II			4	16
Grade I			4	15
	110	83	14	39
Total	300	232	28	58
RFRS, Madhya Pradesh				
Technical	5	3	-	-
RFRS, Orissa				
Technical	4	2	-	-
RFRS, West Bengal				
Technical	4	2	-	-
Total	13	7	-	-
Grand Total	313	239	28	58

METEOROLOGICAL DATA

MONTH	Mean max. temp (°C)	Mean min. temp (°C)	Mean dry bulb temp (°C)	Mean wet bulb temp (°C)	Mean humidity (%)	Total rainfall (mm)	Highest max. temp (°C)	Lowest min. temp (°C)
1996								
April	37.09	19.41	27.87	22.36	62.94	3.50	40.0	17.2
May	39.68	23.46	28.64	24.07	68.54	7.0	43.0	18.8
June	33.66	23.30	26.44	29.90	87.96	287.0	40.0	21.8
July	31.02	22.69	30.39	24.69	81.00	393.0	36.0	20.5
August	29.8	22.05	25.48	23.56	83.45	468.0	34.0	20.0
September	31.58	21.9	27.22	24.94	85.5	201.5	35.5	20.5
October	29.95	18.5	24.6	22.1	80.9	7.25	32.6	15.5
November	28.4	12.6	22.08	19.0	75.2	Nil	32.0	7.6
December	25.51	6.61	15.1	13.05	79.9	Nil	28.6	3.8
1997								
January	22.81	7.6	15.61	12.9	72.51	14.5	25.6	4.0
February	26.06	11.02	18.0	16.5	79.6	8.0	32.2	5.5
March	33.5	16.61	25.4	22.6	80.71	4.5	36.6	12.0

The highest temperature	-	43.0°C on 30th May 1996
The lowest temperature	-	3.8°C on 22nd December 1996
Total rain fall during the period	-	1394.25mm
Monsoon rainfall (June - Sept.)	-	1349.5 mm
Hailstorm	-	None

कार्यकारी सारांश

इस वर्ष भारतीय कृषि अनुसंधान परिषद् द्वारा संस्थानों के कार्यों के लिए दिये गए नए दिशा निर्देशों के अनुरूप संस्थान के अनुसंधान एवं प्रसार कार्यक्रमों में पुनर्स्थिति निर्धारण किया गया। विभिन्न स्तरों पर विचार विमर्श के पश्चात् आने वाले 25 वर्षों के लिए संदर्श योजना वीजन 2020 तैयार किया गया।

संस्थान के दो विभागों द्वारा लाख की खेती, संवर्धन एवं उपयोग के लिए प्रौद्योगिकी विकसित करने हेतु प्रयास जारी है।

अनुसंधान की उपलब्धियाँ

- **कुसुम वृक्ष पर लाख उत्पादन की प्रौद्योगिकी** कुसुमी बीहन एवं कच्ची लाख के उत्पादन के लिए संशोधित उत्पादन प्रौद्योगिकी विकसित की गई है।
- **आकाशमणि के पौधों पर उर्वरकों का प्रभाव** उर्वरकों के प्रयोग से आकाशमणि के पौधों की शीघ्रवृद्धि होती है एवं दो वर्ष के अन्दर ही लाख की खेती के लिए पौधों को तैयार किया जा सकता है।
- **प्रयोगशाला में लाभदायक पारासीट्वॉइडस का पालन**

  लाख नाशीकीट के दमन के लिए दो पारासीट्वॉइड्स, ट्राइकोग्रामा प्रेटीओसम एवं ब्रैकीमेरिया टेकार्डी, का प्रयोगशाला में सफलता पूर्वक पालन किया गया।
- **आइसोम्ब्रीटोलाइड के उत्पादन में सुधार** अभिक्रिया की अवस्थाओं में परिष्करण द्वारा एल्यूरिटीक अम्ल से आइसोम्ब्रीटोलाइड के उत्पादन में 58 से 72% तक की बृद्धि की गई।
- **लाख के भण्डार में अवकर्षण का प्रतिआविष द्वारा रोक**

  कुछ प्रतिआविष का प्रयोग कर लाख के भण्डारण के दौरान अवकर्षण को रोकने में सफलता मिली है।
- **लाख आधारित मंद मोचन कीटनाशी संयोजन**

  तिलचट्टे एवं मच्छरों को नियंत्रित करने के लिए लाख पर आधारित मंदमोचन कीटनाशी संयोजन विकसित किया गया है।

प्रसार उपलब्धियाँ

लाख पर एक दिवसीय एवं एक सप्ताह के कार्यक्रमों में किसानों की सहभागिता में क्रमशः 43 एवं 16% वृद्धि हुआ।

लाख की खेती की प्रौद्योगिकी को लोकप्रियता दिलाने के लिए विभिन्न क्षेत्रों में सात प्रक्षेत्र प्रशिक्षण शिविर आयोजित किये गए। संस्थान द्वारा अन्तर्राष्ट्रीय व्यापार मेला सहित नौ प्रदर्शनियों में स्टाल लगाए गए।

जीराबर गाँव में एक किसान का चयन कर लाख की खेती की शुरूआत की गई। 600 पलास के वृक्षों पर लाख की खेती का प्रदर्शन किया गया।

संस्थान की प्रसार गतिविधियों को मजबूती प्रदान करने के लिए कई संगठनों से सम्पर्क स्थापित किया गया।

राष्ट्रीय संगोष्ठी-लाख उद्योग - चुनौतियाँ एवं समाधान

"लाख उद्योग - चुनौतियाँ एवं समाधान" विषय पर दिनांक 14-15 जून 1996 को राष्ट्रीय संगोष्ठी आयोजित की गई। विस्कोलैम्फ, राँची इस दो दिवसीय संगोष्ठी के सह प्रायोजक थे। संगोष्ठी में 120 प्रतिनिधियों ने भाग लिया एवं 16 शोधपत्र प्रस्तुत किये गए। गहन विचार-विमर्श के पश्चात अनुशंसाओं की सूची तैयार की गई।

रेडियो कृषि पाठशाला प्रतियोगिता

भारतीय लाख अनुसंधान संस्थान के सहयोग से आकाशवाणी, राँची द्वारा प्रसारित रेडियो कृषि पाठशाला पर आधारित प्रतियोगिता आयोजित की गई। प्रतियोगिता के विजेताओं को विशेष पुरस्कार वितरण समरोह में डॉ. आर.एस. परोदा, सचिव, कृषि अनुसंधान एवं शिक्षा विभाग तथा महानिदेशक, भारतीय कृषि अनुसंधान परिषद्, नई दिल्ली ने पुरस्कार प्रदान किया। इस अवसर पर कार्यक्रम में प्रसारित रेडियो वार्ताओं की संकलित पुस्तिका का भी विमोचन किया गया।

परिक्रामी (खिल्वींग) निधि योजना

विभिन्न कृषि जलवायु क्षेत्रों में कुसुम एवं पलास वृक्षों पर अच्छी गुणवता के वीहन लाख उत्पादन के लिए भा.कृ. अनु. प. द्वारा एक परिक्रामी निधि योजना ''प्रोडक्सन ऑफ क्वालिटी ब्रुड लैक ऑन कुसुम एण्ड पलास इन डिफरेन्ट एग्रो कलायमेटीक रिजियनस्'' की मंजूरी दी गई।

श्री यज्ञदत्त मिश्र, वैज्ञानिक (प्रवरण कोटि) परियोजना प्रमुख, डॉ. अजय भट्टाचार्य, वरीय वैज्ञानिक, सह-प्रमुख, डॉ. केवल कृष्ण शर्मा, वैज्ञानिक, वरीय वेतन मान, सह-प्रमुख।

तदर्थ अनुसंधान परियोजना

कृषि उत्पाद कर निधि (ए.पी.सेस फंड) के अन्तर्गत भा.कृ.अनु. परिषद् द्वारा एक तदर्थ अनुसंधान परियोजना ''लैक प्रोडक्टिभिटी रेटिङ्ग ऑफ डिफरेन्ट लैक इन्सेक्टस ऑन कॉनभेन्सनल एण्ड प्रोमिसिङ्ग लैक होस्टस'' की मंजूरी दी गई।

(श्री यज्ञदत्त मिश्र, वैज्ञानिक (प्र.को.) परियोजना प्रमुख, डॉ, सत्यानन्द सुशील, वैज्ञानिक, सह प्रमुख, डॉ. अजय भट्टाचार्य, वरीय वैज्ञानिक, सह प्रमुख)

इस अवधि में निम्नलिखित तदर्थ परियोजनाओं का प्रस्ताव भेजा गया है:

पायलट स्टडी ऑन फोरकास्टीङ्ग ऑफ ब्रुड लैक इलड फ्रॉम ब्यूटिया मोनोस्परमा (पलास)

पोलिब्लेन्डस ऑफ शेलैक वीथ सिन्थेटिक पोलिमारस - फरम्मूलेशन, कैरेक्टराइजेशन एंड एपलिकेशन स्टाडिज

परिचय

भारत में लाख उद्योग की स्थिति की जाँच एवं इसके बहुमुखी सुधार के लिए भारत सरकार द्वारा गठित जाँच समिति की अनुशंसा के फलस्वरूप भारतीय लाख अनुसंधान संस्थान (भा.ला.अनु.सं.) की स्थापना की गई। उक्त समिति के सुझावों के कार्यान्वयन हेतु लाख उद्योग से जुड़े लोगों ने ''इन्डियन लैक एसोशिएशन फॉर रिसर्च'' नामक एक गैर सरकारी संस्था का गठन किया तथा इसे पंजीकृत कराया गया। इस ऐसोशिएशन ने 1925 में भारतीय लाख अनुसंधान संस्थान की स्थापना की। सन् 1931 में भारतीय लाख कर समिति ने इस संस्थान की अधिग्रहण कर लिया। भारतीय लाख कर समिति की समाप्ति के पश्चात् अप्रैल 1966 से भारतीय लाख अनुसंधान संस्थान, भारतीय कृषि अनुसंधान परिषद (भा.कृ.अनु.प.) के प्रशासनिक नियन्त्रण में आ गया।

संस्थान

रांची शहर से नौ कि. मी. पूर्व में रांची टाटा राष्ट्रीय राजमार्ग पर स्थित यह संस्थान कुल 49 है. क्षेत्र में फैला हुआ है। मुख्य परिसर में लाख उत्पादन विभाग, लाख संशोधन एवं उत्पाद विकास विभाग, प्रौद्योगिकी हस्तांतरण विभाग, प्रशासकीय, वित्त व लेखा, पुस्तकालय, तकनीकी एवं अनुवीक्षण कक्ष एवं यात्रिकी अनुबाग के अतिरिक्त औषाधालय एवं आवास गृहों के भवन स्थित है। इसके निकट एक छोटे परिसर में लाख संशोधन एवं उत्पाद विकास विभाग की एक प्रयोगशाला, प्रशिक्षु छात्रावास एवं आवास भवन स्थित हैं। संस्थान के दोनों परिसरों में खेल के मैदान हैं। इन दोनों परिसरों के निकट, क्षेत्र परीक्षणों के लिए 36.5 हे. का बागान है। संस्थान के अन्तर्गत एक क्षेत्रीय लाख अनुसंधान केन्द्र भी कार्य कर रहा है जो मध्य प्रदेश के धर्मजयगढ़ में स्थित है। भारतीय लाख अनुसंधान लाख की खेती परिष्करण एवं उपयोग संबंधी अनुसंधान में कार्यरत एक अग्रणी संस्था है। लाख की खेती अधिकाशत: बिहार एवं इसके निकटवर्ती राज्यों की जनजातियों द्वारा लगभग 80,900 वर्ग कि. मी. क्षेत्र में की जाती है। अपने स्थापना काल से ही संस्थान लाख के उत्पादन तथा उपयोगिता में वृद्धि हेतु उपयुक्त प्रौद्योगिकी के विकास एवं प्रसार में सतत प्रयत्नशील रहा है तथा अनेक प्रविधियों एवं उत्पाद विकसित किए गए हैं। उद्योगों की बदलती हुई आवश्यकताओं को ध्यान में रखते हुए नये क्षेत्रों की खोज के लिए प्रयास जारी है। लाख की खेती एवं उपयोग के क्षेत्र में अनुसंदान कार्य के लिए भारतीय लाख अनुसंधान संस्थान अर्न्तराष्ट्रीय ख्याति प्राप्त कर चुका है।

उद्देश्य

मुख्य संस्थान

- प्रचलित अथवा प्रजनन क्षमता में उन्नत लाखकीट एवं परिपालक वृक्षों का उपयोग कर लाख उत्पादन के तकनीक का विकास
- उद्योग के लिए लाख संसाधन की तकनीकी का विकास
- प्रयोगिक संयन्त्र प्रदर्शन के लिए नानारूपकरण हेतु अनुसंधान कार्य करना
- किसानों एवं उद्यमियों को तकनीकी का हस्तांतरण।
- लाख उत्पादन, संसाधान एवं उपयोगिता संबंधी सूचना का संग्रह

क्षेत्रिय अनुसंधान केन्द्रों

- विभिन्न शस्य-जलवायु की परिस्थितियं में उन्नत

लाख की खेती की प्रौद्योगिकी की जाँच

- वीहन लाख उत्पादन एवं क्षेत्रीय परिपालकों का उपयोग
- एग्रो-फोरेस्ट्री (कृषि वानिकी) विधि से लाख उत्पादन की बढ़ाने हेतु किसानों का परिशिक्षण
- क्षेत्रीय आधार पर उद्योमी चेतना कार्यक्रम

संगठनात्मक व्यवस्था

संस्थान के शीर्ष अधिकारी निदेशक होते हैं। अनुसंधान कार्य के लिए तीन विभाग है (1) लाख उत्पादन (2) लाख संशोधन एवं उत्पादन विकास तथा (3) प्रौद्योगिकी हस्तांतरण।

प्रशासनिक खण्ड में निदेशक का कार्यालय, प्राशसकीय अनुभाग, क्रय अनुभाग, वित्त व लेखा अनुभाग एवं केन्द्रीय भण्डार है। सहायक ईकाइयों के अन्तर्गत हिन्दी प्रकोष्ठ, सुरक्षा, चिकित्सा और संपदा अनुरक्षण सेवाएं हैं। तकनीकी सहयोग हेतु पुस्तकालय, फार्म ईकाई, अनुरक्षण एवं कर्मशाला तथा निदेशक (तकनीकी एवं मॉनिटरिंग) ईकाई कार्यरत है।

स्टाफ

संस्थान में 56 वैज्ञानिक, 83 तकनीकी, 51 प्रशासकीय एवं 110 चतुर्थवर्गीय पद स्वीकृत है।

बजट

वर्ष 1996-97 की अवधि में गैर योजना मद में रू. 166.00 लाख के बजट अनुमान के विपरीत रू. 201.27 लाख खर्च हुआ जबकि योजना मद में बजट अनुमान रू. 60.00 लाख के विपरीत रू. 49.86 लाख खर्च हुआ।

राजभाषा एकक

संस्थान के दैनिक कार्य में राजभाषा हिन्दी के प्रगामी प्रयोग के लिए भारत सरकार के राजभाषा विभाग द्वारा तैयार किए गए वार्षिक कार्यक्रम एवं राजभाषा नीति के कार्यान्वयन के लिए तथा राजभाषा अधिनियम एवं नियमों के संबंध में भारतीय कृषि अनुसंधान परिषद नई दिल्ली से समय समय पर प्राप्त निर्देशों के अनुवर्ती कार्रवाई हेतु संस्थान में राजभाषा एकक का गठन किया गया है। इसमें एक सहायक निदेश (राजभाषा) एवं हिन्दी अनुवादक कार्यरत हैं।

कार्यालय के दैनिक कार्यों में हिन्दी कें प्रयोग में प्रगति, हिन्दी को सर्वग्राह्य बनाने के लक्ष्य की प्राप्ति एवं बहुअयामी उपयोग के लिए राजभाषा एकक द्वारा निम्नलिखित कार्य किए जाते हैं:-

- संस्थान राजभाषा कार्यान्वयन समिति की बैठक का आयोजन, कार्यसूची एवं कार्यवृत की तैयारी तथा लिए गए निर्णयों पर अनुवर्ती कार्रवाई।
- वार्षिक रिर्पोट का सारांश, कार्यलय आदेश परिपत्र, ज्ञापन, निविदा सूचना कोटेशन इत्यादि का अनुवाद।
- अहिन्दी भाषी अधिकारियों/कर्मचारियों को हिन्दी शिक्षण योजना द्वारा आयोजित हिन्दी प्रशिक्षण के लिए नामित करना।
- हिन्दी दिवस, हिन्दी सप्ताह एवं हिन्दी प्रतियोगिताओं का आयोजन।
- संदर्भ साहित्य, हिन्दी पत्रिकाएं, शब्दकोष एवं तकनीकी शब्दावलियों का उपार्जन।
- हिन्दी में वैज्ञानिक गोष्ठी का आयोजन।

उपरोक्त उद्देश्यों को पूर्ण करने हेतु संस्थान राजभाषा कार्यान्वयन समिति कार्यरत रही। समिति में निम्नलिखित सदस्य थे।

डॉ. सतीश चन्द्र अग्रवाल, निदेशक	अध्यक्ष
डॉ. शिशिर कुमार साहा, अध्यक्ष लाख संसधान एवं उत्पाद विकास विभाग	सदस्य
डॉ. प्रणय कुमार, अध्यक्ष, लाख उत्पादन विभाग	सदस्य
श्री रंगनादन रमणि, अध्यक्ष, प्रौद्योगिकी हस्तांतरण विभाग	सदस्य
श्री श्रीकृष्ण मणि त्रिपाठी, वरिष्ठ तकनीकी अधिकारी	सदस्य
श्री नरेन्द्र कुमार शर्मा, फार्म अधीक्षक	सदस्य
श्री राजीव लाल, प्रशासनिक अधिकारी	सदस्य
श्री राम प्रताप तिवारी, पुस्तकालयाध्यक्ष	सदस्य
श्री नागेन्द्र महतो, सहायक प्रशानिक अधिकारी	सदस्य
	सदस्य
श्री लक्ष्मी कान्त, सहायक निदेशक (रा. भा.)	सदस्य सचिव

निदेशक महोदय की अध्यक्षता में संस्थान में 4.5.96, 3.9.96 एवं 23.11.96 को राजभाषा कार्यान्वयन समिति की बैठक हुए एवं सर्वसम्मति से निम्नलिखित महत्वपूर्ण निर्णय लिए गए :

- हिन्दी में कम्प्यूटर प्रशिक्षण
- हिन्दी निबंध, टिप्पणी प्रारूप लेखन, वाद विवाद, भाषण, काव्यपाठ एवं अन्ताक्षरी प्रतियोगिताओं का आयोजन
- पुराने टाइप राइटरों के देवनागरी कुंजीपटल बदला जाना
- संस्थान के वार्षिक प्रति वेतन में सारांश के साथ साथ अन्य खण्डों को भी हिन्दी में प्रकाशित किया जाना
- हिन्दी कार्यशाला का आयोजन
- हिन्दी दिवस समारोह का आयोजन

उपरोक्त निर्णयों के आलोक में संस्थान के विभिन्न विभागों/अनुभागों में प्रयुक्त होने वाले द्विभाषी/हिन्दी मुहर तैयार करवाकर संबंधित विभागों/अनुभागों में वितरित किया गया समिति के निर्मयों की कार्यवृत की तैयारी एवं अनुवर्ती कार्रवाई की गई।

सितम्बर 1996 को हिन्दी दिवस समारोह का आयोजन किया गया। संदर्भ साहित्य के रूप में संस्थान पुस्तकालय हेतु हिन्दी पत्र पत्रिकाओं एवं पुस्तकों का क्रय किया गया।

अनुवाद कार्य-वार्षिक प्रतिवेदन के साथ-साथ राजभाषा अधिनियम के धारी 3(3) के अधीन कागजातों का हिन्दी रूपान्तर तैयार किया गया एवं संस्थान द्वारा नियिति आवासों का आवंटन 1993 का हिन्दी रूपान्तर तैयार किया गया।

नगद पुरस्कार योजना : राजभाषा विभाग के प्रावधानों के अनुसार मूल रूप से हिन्दी में टिप्पण व प्रारूप लेखन हेतु नगद पुरस्कार योजना लागू किया गया जिसमें 8 कर्मचारियों ने भाग लिया।

हिन्दी प्रतियोगिताओं का आयोजन : संस्थान में राजभाषा हिन्दी के प्रयोग को बढ़ाने एवं अधिकारियों एवं कर्मचारियों के बीच हिन्दी के प्रयोग में स्पर्द्धा उत्पन्न करने के उद्देश्य से हिन्दी प्रतियोगिताओं का आयोजन किया गया एवं प्रथम तथा द्वितीय स्थान प्राप्त करने वाले निम्नलिखित प्रतिभागियों को पुरस्कृत किया गया।

हिन्दी निबंध

प्रथम - श्री अमर कुमार सहाय
द्वितीय - श्री अर्जन गोप

हिन्दी सुलेख

प्रथम - श्री मदन मोहन
द्वितीय - श्री राधा किशुन टोप्पो

हिन्दी टिप्पण

प्रथम - श्री प्रहलाद सिंह
द्वितीय - श्री बैजनाथ गोप

हिन्दी प्ररूपण

प्रथम - श्री शरत चन्द्र लाल
द्वितीय - श्री कवल किशोर प्रसाद

हिन्दी अन्ताक्षरी

विजयी दल
श्री कवल किशोर प्रसाद
श्री विजय कुमार तिवारी
श्री प्रहलाद सिंह
श्री रघुनाथ महतो
श्री कामेश्वर प्रसाद आर्य
श्री अरूण कुमार त्रिपाठी

राँची नगर राजभाषा कार्यान्वयन समिति की बैठकों में सहभागिता :

राँची नगर राजभाषा कार्यान्वयन समिति द्वारा आयोजित दिनांक 26 अगस्त 1996 को डा. सतीश चन्द्र अग्रवाल निदेशक, श्री श्रीकृष्ण मणि त्रिपाठी वरिष्ट तकनीकी अधिकारी एवं इसके अतिरिक्त दिनांक 26.2.97 को आयोजित बैठक में श्री लक्ष्मीकान्त सहायक निदेशक (रा.भा.) ने भाग लिया।

राजभाषा हिन्दी को लोक प्रिय बनाने हेतु कारगर उपाय:

संस्थान के विभिन्न विभागों एवं अनुभागों में कार्यरत अधिकारियों/कर्मचारियों को अंग्रेजी शब्दों के हिन्दी पर्याय सहजरूप से उपलब्ध करवाने हेतु सभी वोर्डों पर एक दिन में एक ही प्रकार का शब्द लिखा गया जिससे पुनरावृति के कारण पर्याय आसानी से याद हो जाय।

हिन्दी में वैज्ञानिक गोष्ठी का आयोजन

वैज्ञानिक क्षेत्र में हिन्दी का प्रगति लाने के विचार से हिन्दी में निम्नलिखित व्याख्यान आयोजित किए गए

- लाख की विरंजन प्रक्रिया - डॉ. निरंजन प्रसाद
- एल्युरिटिक अम्ल एवं कार्बनिक संश्लेषण में इसका उपयोग - डॉ. रवीन्द्र नाथ मांजी
- भारत में विभिन्न प्रकार के रंग - डॉ. आशिष कुमार दासगुप्ता
- पलास के विभिन्न उपयोग - डॉ. अनिल कुमार जायसवाल
- शत्रुकीटों का व्यावहारिक नियंत्रण - डॉ. अजय भट्टाचार्य
- एल्यूरिटिक अम्ल का पृथकीकरण बनावट गुण एवं उपयोगी - श्री इरूदय राजेन्द्रण

संस्थान को प्राप्त सम्मान

राँची नगर राजभाषा कार्यान्वयन समिति की वर्ष 1996-97 की पहली बैठक 27 अगस्त 1996 को मेकन सामुदायिक भवन श्यामली में सम्पन्न हुई। उक्त बैठक में भारत सरकार गृह मंत्रालय राजभाषा विभाग के सचिव श्री चन्द्रधर त्रिपाठी ने केन्द्र सरकार के कार्यालयों में राजभाषा के सर्वाधिक उपयोग हेतु भारतीय लाख अनुसंधान संस्थान नामकुम राँची को द्वितीय स्थान प्राप्त करने पर (श्रेष्ठता प्रमाण पत्र) एवं ट्राफी प्रदान किया।

हिन्दी दिवस समारोह

संस्थान में दिनांक 13 सितम्बर 1996 को हिन्दी दिवस समारोह का आयोजना किया गया। इस अवसर पर मुख्य अतिथि के रूप में सुप्रसिद्ध हिन्दी साहित्यकार एवं प्राध्यापक, हिन्दी विभाग, राँची विश्वविद्यालय,

संस्थान के निदेशक, डा. सतीश चन्द्र अग्रवाल (दाहिने), हिन्दी दिवस समारोह में स्वागत भाषण देते हुए, बीच में मुख्य अतिथि डा. बालेन्दु शेखर तिवारी एवं बायें हिन्दी दिवस समारोह आयोजन समिति के अध्यक्ष, डा. दीपेन्द्र नाथ गोस्वामी.

मुख्य अतिथि, डा. बालेन्दु शेखर तिवारी प्राध्यापक, स्नातकोत्तर हिन्दी विभाग, राँची विश्वविद्यालय, भाषण देते हुए.

राँची नगर राजभाषा कार्यान्वयन समिति के वार्षिक समारोह में संस्थान द्वारा राजभाषा में कार्य के उत्कृष्ट निष्पादन हेतु भारत सरकार राजभाषा विभाग के सचिव श्री चन्द्रधर त्रिपाठी आई. ए. एस से द्वितीय पुरस्कार ग्रहण करते हुए संस्थान के निदेशक डा. सतीश चन्द्र अग्रवाल.

डॉ. बालेन्दु शेखर तिवारी उपस्थित थे। डॉ. तिवारी दीप प्रज्जवलित कर समारोह का शुभारंभ किये।

स्वागत गान के पश्चात् संस्थान के निदेशक, डॉ. सतीश चन्द्र अग्रवाल ने अपने स्वागत भाषण में संस्थान में हिन्दी के प्रयोग की चर्चा करते हुए बताया कि यहाँ काफी पूर्व काल से ही कार्यालय एवं अनुसंधान के कार्यों में हिन्दी का प्रयोग होता आ रहा है। डॉ. अग्रवाल ने बताया कि संस्थान द्वारा आकाशवाणी राँची के सहयोग से लाख की उन्नत खेती की तकनीकों की जानकारी देने के लिए रेडियो वार्ता की श्रृंखला का आयोजन किया गया तथा प्रसारित पाठों को संकलित कर पुस्तक तैयार किया गया है। उन्होंने बताया हिन्दी में उल्लेखनीय कार्य के लिए संस्थान को राँची नगर राजभाषा कार्यान्वयन समिति द्वारा द्वितीय पुरस्कार प्रदान किया गया है। उन्होंने समारोह में उपस्थित होने के लिए मुख्य अथिति के प्रति आभार प्रकट किया।

डॉ. बालेन्दु शेखर तिवारी ने मुख्य अतिथि के रूप से बोलते हुए आयोजकों के प्रति हार्दिक आभार प्रकट किया एवं विभिन्न क्षेत्रों में प्रचलित हिन्दी भाषा के बोलचाल के परिवर्तित रूपों की रोचक जानकारी दी। उन्होंने इस बात पर खेद प्रकट किया कि आजादी के इतने वर्षों बाद भी हिन्दी को हम पुरी तरह नहीं अपना सके हैं। उन्होंने तुर्की के नेताओं द्वारा तुर्की भाषा के अपनाने का उदाहरण देते हुए कहा कि हमारे पास दृढ़ इच्छा शक्ति का अभाव है, फिर भी इस ओर किया जा रहा सार्थक प्रयास हमें सफलता की ओर ले जाएगा।

इस अवसर पर सांस्कृतिक कार्यक्रम के अन्तर्गत सुश्री कृषा डे ने भजन, सुश्री मौसमी डे ने गीत, श्री बैजनाथ गोप ने नागपुरी गीत तथा डॉ. सत्यानन्द शुशील एवं श्री अनिल कुमार सिन्ही ने कविता प्रस्तुत किया। श्री राम प्रताप तिवारी ने राष्ट्रभाषा की महत्ता पर प्रकाश डाला।

संस्थान में हिन्दी के प्रयोग से संबंधित प्रगति प्रतिवेदन डॉ. अंजेश कुमार ने प्रस्तुत किया। इस अवसर पर संस्थान में आयोजित हिन्दी की विभिन्न प्रतियोगिताओं में प्रथम एवं द्वितीय स्थान प्राप्त करने वाले प्रतियोगियों को मुख्य अतिथि महोदय ने पुरस्कार प्रदान किया। समारोह के अन्त में हिन्दी दिवस समारोह आयोजन समिति के अध्यक्ष डॉ. दीपेन्द्रनाथ गोस्वामी ने कार्यक्रम को सफल बनाने के लिए मुख्य अतिथि एवं अन्य सबों को धन्यवाद ज्ञापन किया। सभा का संचालन डॉ. अंजेश कुमार ने किया।

इस अवसर पर कार्यलय कार्यों एवं अन्य क्षेत्रों से संबंधित हिन्दी प्रकाशनों की प्रदर्शनी भी लगाई गई।

अनुसंधान के सारांश

लाख उत्पादन विभाग

संपूरित अनुसंधान

1.1.9 कुसुम पर लाभदायक वीहन तथा कच्ची लाख के उपयुक्त प्रबन्धन विधियाँ विकसित करने के लिए हेसल प्रायोगिक क्षेत्र पर वास्तविक ग्रामीण स्थिति में तथा संस्थान के क्षेत्र एवं प्रयोगशाला में परीक्षण किये गए। कुसुम पर लाख की खेती के प्रचलित तरीकों में स्वत: संचारण करवा कर कुसमी लाख उत्पादन की एक नई पद्धति अनुशंसित की गई। इस नई पद्धति को परिपालक पौधों की उपलब्धता के अनुरूप पाँच/चारकूप पद्धति में सुविधाजनक रूप से अपनाया जा सकता है। कुसुम के उपलब्ध क्षेत्र के लिए फसल के संचारण का आंकलन एवं उपज के अनुमान के लिए नमूना विकसित किया गया।

लेपीडोप्टेरस, न्यूरेप्टेरन परभक्षी एवं फफूंद रोगजनक के प्रबन्धन के लिए अगहनी एवं जेठवी फसल हेतु रासायनिक नियंत्रण तरीके विकसित किये गए।

क्रियमाण अनुसंधान

1.1.10 आकाशमणि के पेड़ों की छँटाई की गई बिन्दुओं एवं कुल परिणामिक संचारित क्षेत्र में सह संबंध स्थापित किया गया। प्रति छँटाई विन्दु पर अठारह महीने बाद फरवरी, जुलाई एवं अक्तूवर में छँटाई के परिणामस्वरूप पेड़ों के प्ररोहो की लम्बाई का औसत क्रमश: 4.9, 5.2 एवं 4.5 पाया गया। आकाशमणि से प्राप्त रंगीनी एवं कुसमी बीहन लाख का परम्परागत लाख परिपालकों पलास एवं कुसुम पर तथा विपरीत क्रम में प्रयोग करने पर संतोषजनक पाया गया। आकाशमणि बीहन लाख को जब लगातार उसी परिपालक पर लगाया गया तो, बाद के वर्षो में उत्पादन में धीरे-धीरे कमी होती गई। परम्परागत लाख परिपालकों पलास एवं कुसुम से एकान्तरण करते हुए आकाशमणि के लिए लाख की खेती की एक उपयुक्त तकनीक विकसित की गई। इस तकनीक में रंगीनी एवं कुसमी दोनों प्रजातियों के लिए चार कूप पद्धति की अनुशंसा की गई।

वर्षा एवं शीत ऋतु के फसलों (कतकी/अगहनी) के लिए आकाशमणि के दो कुपों का बारी-बारी से उपयोग किया गया एवं उसी तरह ग्रीष्म ऋतु के फसलों (वैशाखी/जेठवी) के लिए पलास और कुसुम के दो कुपों का उपयोग किया गया। प्रति मीटर प्ररोह की लम्बाई पर 15-20 ग्रा. बीहन का प्रयोग दर की अनुशंसा की गई है।

1.1.12 पलास पर वर्षा, ग्रीष्म एवं ग्रीष्म सह वर्षा ऋतु की फसलों के लिए बीहन की उपयुक्त आवश्यकता, प्ररोह की लम्बाई पर, क्रमश: 15-20, 10-15 एवं 10-15 ग्रा./मी. हैं।

उपरोक्त मैसम में बेर के प्ररोह पर बीहन लाख की आवश्यकता क्रमश: 15-20, 10-15 एवं 5-10 ग्रा./मी. की होगी। बेर से अरी लाख लेने के लिए प्रति मीटर प्ररोह 20 ग्रा. बीहन लाख की जरूरत होती है।

1.4.21 लेपिडोप्टेरस परभक्षी के निचोड़ से पारासीट्वाइड को आकर्षित करने के एक्टिभ प्रिन्सिपल का मौजूदगी का पता चलता है।

लाख कॉलोनी के उपर ट्रिप्टोफैन का छिड़काव करने पर अण्डा देने के लिए वयस्क क्राईसोपा मादाओं को आकर्षित करता है।

भिन्न-भिन्न महीनों में संचारित किये गए लाख कॉलोनियों में विभिन्न परभक्षियों एवं पारासीट्वाड्स के होने में काफी अन्तर पाया गया। दिसम्बर 1996 में संचारित जल्दी परिपक्व होने वाली कुसमी किश्म में परभक्षी बिल्कुल नहीं देखे गए।

टेट्रास्टीकस परप्यूरियस, कोकोफैगस चीर्ची, टैकार्डीफेगस टेकार्डी भण्डारित लाख में होने वाले पेस्ट श्यूडोहाइपाटोपा पल्वेरिया का पारासीट्वाइंड्स पाया गया।

पी. पल्वेरिया के अण्डो को प्रयोगशाला में अण्डा पारसीट्वाइड्स, ट्राइकोग्रामा पेट्रीओसम, द्वारा सफलतापूर्वक परजीवी बनाया गया। ब्रेकीमेरिया टेकार्डी को वैकल्पिक परिपालक कॉरसीश सेफालोनिका के प्यूपा पर प्रयोगशाला में पालने की तकनीक मानकीकृत की गई।

ई. एमाविलीस के एक सन्देहास्पद माने जाने वाले पारासीट्वाइड्स ब्रेकीसीरटस यूब्लीमा को क्राइसोपा प्रजाति के प्यूपा से पहाली बार अभिलेखित किया गया।

अण्डे को 15 से 20 मिनट तक परावैगनी प्रकाश में रखने पर ई. एमाविलीस के स्फूटन प्रभावित होता है।

1.5.8 विभिन्न क्षेत्रों के लाख कीट जर्मप्लाज्म के कुल बारह स्टॉकों का रख रखाव किया गया। चार रंगीनी, एक कुसमी एवं पश्चिम बंगाल (अमरसी, मिदनापुर) के समुद्री क्षेत्र के एक ट्राइवोक्टाइन नस्ल का उनके विभिन्न जैविक एवं औद्योगिक गुणों का मूल्यांकन किया गया। माली बसन्तपुर एवं बलरामपुर से प्राप्त क्रिमसन लाख कीट आर्थिक गुणों के मामले में माली बसन्तपुर पीला एवं तुरहामु क्रिमसन कीटो से वेहतर पाये गए।

1.5.13 रेजीन के रंग में सुधार लाने के लिए प्रायोगिक लाइनों के बीच क्रॉस से उपलब्ध एफ-1 संतति को उगाए गए। कीट संख्या, घनत्व एवं सेटेल्ड लार्वा के आकार का लाख कीटों के लिंगानुपात पर प्रभाव का अध्ययन किया गया। नरों के अनुपात एवं बचे हुए कीटों के बीच एक सकारात्मक सह संबंध पाया गया। विभिन्न मानदंडो के लिए अन्त: प्रजात क्रीम एवं ट्राइवोल्टाइन लोइनों का अध्ययन किया जा रहा है।

2.1.13 3.0x2.7 मी. की दूरी पर लगाए जाने से आकाशमणि का पौध बृद्धि गुण सबसे अच्छा देखा गया। अधिक दूरी पर लगाने से एल.आई.आर में पर्याप्त कमी आई परन्तु कटाई की गई कुल वायोमास के मामले में परिणाम विपरीत पाया गया। 75+150+30 ग्रा. प्रति पौधा नाइट्रोजन + फॉस्फोरस पेटांक्साइड +पोटैशियम ऑक्साइड देने से परिणाम वेहतर रहा एवं नियंत्रण तथा उर्वरक स्तर से क्रमश: 84.2, 35.7 एवं 28.5% अधिक कच्ची लाख का उत्पादन हुआ। उर्वरकों के विभिन्न मात्रा के प्रयोग से पौधा बृद्धि गुण में पर्याप्त प्रभाव पाया गया।

2.1.14 बीज के साथ 25 ± 2 से. पर ऑक्सीन के विभिन्न सान्द्रता पर एम.एस.माध्यम के साथ कैलश बृद्धि हेतु प्रयास किया गया, लाख परिपालक प्रजातियों के कक्षावर्ती कलियों का वीट्रों में परीक्षण किया गया। अध्ययन किये गए लाख परिपालक पौधों में सबसे अधिक कैलश वृद्धि क्रमश: बेर के मामले में 2,4-डी का 6 पी.पी. एम के साथ 50% जब कि गलवांग के मामले 2,4-डी का 10 एवं

8 पी.पी. एम के साथ क्रमशः 28.6% एवं 25.0% अभिलेखित किया गया।

2.2.7. इक्रीसैट, हैदराबाद से प्राप्त फ्लेमेंजिया प्रजाति के 10 जर्मलाइन्स को लाख परिपालक के रूप में उनके संभाव्यता का मूल्यांकन किया गया। अपेक्षाकृत निम्न पौध बृधि गुण के बावजूद भी एफ. सेमियालता (आई.सी.पी. डब्ल्यू - 201) में कच्ची लाख की उपज सबसे ज्यादा रही। आई.सी.पी. डब्ल्यू-202 एवं 196 से भी अच्छी फसल प्राप्त हुई।

नेत्रजन के प्रयोग से एफ. सेमियालता के पौध गुण वृद्धि शुरू में तथा वायोनास की मात्रा भी प्रभावित हुआ। पौधों के बीच दूरी से पौधों की ऊँचाई, लाख कीटों के बैठने की लम्बाई एवं प्रति पेड़ उपज पर काफी प्रभाव पड़ा। कोशिका का वजन विभिन्न स्तर के नाइट्रोजन के प्रयोग से विपरीत संबंध रहा एवं उपज तथा उपज गुणों पर कोई प्रभाव नहीं पड़ा।

तदर्थ अध्ययन

1. पश्चिम बंगाल के समुद्री क्षेत्र से अभिलेखित ट्राइवोलटाइन लाख कीट ने अपने मूल स्थान में एक वर्ष में तीन पीढ़ी पूर्ण किया परन्तु राँची की जलवायु में केवल 2.6 पीढ़ी पूर्ण किया।
2. विशेष कर जेठवी फसल ऋतु में अगात किस्म की कुसमी लाख कीट से पछात किस्म की लाख कीट की तुलना में प्रति इकाई लम्बाई पर अधिक वजन की लाख आवर्त प्राप्त हुई।

लाख संसाधन एवं उत्पाद विकास विभाग

सम्पूरित अनुसंधान

3.2.15 परिवकृत अभिक्रिया अवस्थाओं से आइसोम्ब्रीटोलाइड के उत्पादन में 58 से 72% तक वृद्धि हुई। इसे अन्य विधियों द्वारा भी तैयार किया गया जिससे केवल 30% उत्पादन हुआ। एल्यूरिटीक अम्ल से आइसोम्ब्रीटोलाइड के संश्लेषण के लिए एक नई विधि विकसित की गई, जिससे 47% उत्पादन हुआ। एल्यूरिटीक अम्ल के आवधिक ऑक्सीकरण उत्पादों में से एक एत्रीलीक अम्ल एल्डिहाइड से कस्तूरी जैसा सुगन्ध वाले डाइलाक्टोन 4-डाईऔक्सा-2,3 डाइऔक्सा-साइक्लोपेन्टाडेक - 6- इन को संश्लेषित किया गया। एल्यूरिटीक अम्ल से एक नये विधि द्वारा 25% उत्पादन वाला इक्जालटोन (साइक्लो पेन्टाडीकानोन) संश्लेषित किया गया।

दो पी. जी. नियामक अनुरूप मिथाइल-9-मिथाइल स्लफोनीलौक्सी -2- नोनेनोएट एवं 10- कार्बोम्सी मिथाइल - 2- डेसीनोइक अम्ल को संश्लेषित किया गया एवं पी.एम.आर एवं मास स्पेक्ट्रा द्वारा अभिलक्षित किया गया।

3.4.7 एल्यूरिटीक अम्ल बनाने के दौरान प्राप्त उपोत्पाद से हवा में सुखने वाले एवं भर्जन (बेकिङ्ग टाईप) के प्रयोगों के लिए वार्निश का संयोजन विकसित किया गया। उपरोक्त उपोत्पाद से अकार्बनिक पदार्थों जैसे सोडियम क्लोराइड के हटाने की विधि विकसित की गई। गमी मास से सोडियम क्लोराइड निकालने के पश्चात प्राप्त उपोत्पाद से दूसरा वार्निश

संयोजन भी विकसित किया गया।

3.5.6 तिलचट्टा (बी. जर्मेनीका) के नियंत्रण के लिए आधात्री के रूप में गमी हाइड्रोलाइज मास एवं सक्रिय कीटनाशी के रूप में क्लोरपायरीफोस पर आधारित एक मंदमोचन बहुस्तरीय पटलित पद्धत्ति विकसित की गई। बायो-एसे अध्ययन से सक्रिय कीटनाशी के वांछित मंदमोचक होने का पता चला। तिलचट्टा (बी. जार्मेनीक) के नियंत्रण के लिए लाख आधारित मंदमोचन एकाश्म कीटनाशी के अलग करने की पद्धति विकसित की गई।

इस पद्धति में क्लोरपाइरीफोस एक सक्रिय कीटनाशी एवं चपड़ा/विरंजित लाख आधात्री के रूप में होता है। बाये-एसे से पता चलता है कि यह पद्धति लम्बी अवधि के लिए तिलचट्टे के लिए प्रभावी है एवं इसके कई बार प्रयोग की कोई आवश्यकता नहीं है।

मच्छरों के लार्वा को मारने के लिए आधात्री के रूप में लाख उपोत्पाद मोल्लमा एवं सक्रिय कीटनाशी के रूप में क्लोरपायरीफोस पर आधारित केक/टेवलेट के आकार में मच्छर की लार्वानाशी पद्धत्ति विकसित की गई। आधात्री के रूप में मोलम्मा विस्तारक/पूरक के रूप में कैल्शियम कार्बोनेट एवं बाइन्डर के रूप में पी.वी.ए पर आधारित दानेदार आकार का फॉर्मुलेशन तैयार किया गया

3.6.5 पॉलीविनाइल एसीटेट एवं पॉलीविनाइल एसीटल रेजीन के साथ अलग से चापड़ा के घोल के मिश्रण का परावैद्युत गुणों की जाँच की गई। रेजीन के अलग-अलग घटकों की तुलना में मिश्रण की परावैधुत शक्ति ज्यादा पायी गई। चपड़े से अनुवर्त्तन रोध में एवं पॉलीविनाइल एसीटेट की आर्द्रता में सुधार होता है। पॉलीविलाइलएसीटल रेजीन से चपड़े के गुणों में व्यापक सुधार होता है। उपरोक्त बहुलकों के लिए एक विस्तारक के रूप में चपड़े के संभावित उपयोग के संकेत प्राप्त हुए है। घोल की अवस्था में चपड़ा एवं पॉलीविनाइल एसीटल रेजीन के संमिश्रण को सामान्य उद्देश्यों के लिए हवा में सुखने वाले विद्युत रोधी वार्निश/लैक्कर के रूप में उपयोग किया जा सकता है।

5.7 लाख के पुराना होने पर अवकर्षण के विरचना की जाँच की गई। यह देखा गया कि पराबैंगनी विकिरण के लिए अनावृत करने पर लाख के बहाव (फ्लो) एवं ताप बहुलकन समय जैसे गुणों का तेजी से ह्रास होता है। परिणाम से यह स्पष्ट होता है कि परिवेशी अवस्था के अन्तर्गत भण्डारण के दौरान प्रकाश आधारित ऑक्सीकरण के कारण लाख का बहुलकन होता है जिससे हाइड्रोपारोक्साइड का निर्माण होता है। प्रति आविस के समावेशन से लाख के गुणों में उच्चस्तर का स्थिरीकरण हुआ।

क्रियमाण अनुसंधान

3.3.14 लाख के कैल्शियम लवण से लाख रंजक (तकनीकी कोटि) तैयार करने की विधि को मानकीकृत किया गया। चूना विधि का प्रयोग कर लाख उद्योग का एक उपोत्पाद किरी से एल्यूरिटीक अम्ल प्राप्त करने की आशा बनती है। एल्यूरिटीक अम्ल (द्रवणांक 98-99 से.) का औसत उत्पादन किरी के रेजीन अशं के वजन का 11% प्राप्त हुआ।

तदर्थ अध्ययन

जल एवं तापरोधी चपड़े की वार्निश बनाने के लिए यूरिया एवं थियोरिया के विभिन्न अनुपातों के साथ रूपांतरित चपड़ा वार्निश के फिल्म गुणों की जाँच की गई।

कार्मिक सूची

(31.03.1997)

निदेशक

डॉ. सतीश चन्द्र अग्रवाल

लाख उत्पादन विभाग

विभागाध्यक्ष

डॉ. प्रणय कुमार

वरिष्ठ वैज्ञानिक

श्री अन्जार हुसैन नक्वी (कृषि कीट)
श्री रमेश चन्द्र मिश्र (कृषि कीट)
डॉ. भरत प्रसाद सिंह (शस्य विज्ञान)
डॉ. शंकर कुमार जयपुरियार (कृषि कीट)
डॉ. अजय भट्टाचार्य (कृषि कीट)
श्री सतीश चन्द्र श्रीवास्तव (पौध प्रजनन)

वैज्ञानिक (प्रवरण कोटि)

श्री शालिग्राम चौधरी (कृषि कीट)

वैज्ञानिक

डॉ. सत्यानन्द सुशील (कृषि कीट)
डॉ. सौमेन घोषाल (शस्य विज्ञान)

फील्ड/फार्म तकनीशियन

श्री मुन्ना लाल रविदास	(टी-II-3)
श्री शिव शंकर प्रसाद	(टी-II-3)
श्री रामदेव पाठक	(टी-II-3)
श्री कामता प्रसाद गुप्ता	(टी-II-3)
श्री कस्तुर चन्द जैन	(टी-I-3)
श्री करमा अब्राहम नागरूवार	(टी-I-3)
श्री डेविड विलियम रूण्डा	(टी-2)
श्री रामगुलाम सिंह	(टी-1)

प्रयोगशाला तकनीशियन

श्री ध्रुव देव प्रसाद	(टी-II-3)
श्री शिशिर कुमार चटर्जी	(टी-II-3)
श्री घनश्याम दास	(टी-I-3)
श्री राम किशोर स्वांसी	(टी-I-3)
श्री मोहन सिंह	(टी-I-3)

आंशुलिपिक

श्रीमती सुशांति प्रसाद

लाख संशाधन एवं उत्पाद विकास विभाग

विभागाध्यक्ष

डॉ. शिशिर कुमार साहा

प्रधान वैज्ञानिक

डॉ. प्रेमचन्द्र गुप्ता (कार्बनिक रसायन)

वरिष्ठ वैज्ञानिक

डॉ. दीपेन्द्र नाथ गोस्वामी (भौतिकी)
डॉ. बलराम चन्द्र श्रीवास्तव (कार्बनिक रसायन)
डॉ. निरंजन प्रसाद (कार्बनिक रसायन)
डॉ. रवीन्द्र नाथ मांझी (कार्बनिक रसायन)
डॉ. कन्हैया प्रसाद साव (भौतिकी)
डॉ. कृष्ण मोहन प्रसाद (कार्बनिक रसायन)

वैज्ञानिक (वरीय वेतनमान)

श्री पीताम्बर मोहन पाटिल (भौतिकी रसायन)
श्री इरुदय राजेन्द्रण (कार्बनिक रसायन)

वैज्ञानिक

श्री पूर्णचन्द्र सरकार (कार्बनिक रसायन)
श्री वी. केशव राव (कार्बनिक रसायन)
श्री देवेन्द्र ढीगंरा (कृषि सर. संसा. यां.)
श्रीमती संगीता चोपड़ा (विद्युत अभि.)

तकनीकी अधिकारी

श्री भक्ति प्रसाद बनर्जी	(टी-5)
श्री देवधारी सिंह	(टी-5)
श्री नव कुमार डे	(टी-5)
श्री तरुण कुमार साहा	(टी-5)

प्रयोगशाला तकनीशियन

श्री भोला राम	(टी-II-3)
श्री विष्णु पद घोष	(टी-II-3)
श्री नोवास मिंज	(टी-II-3)
श्री मिथिलेश कुमार सिंह	(टी-II-3)
श्री वसन्त प्रसाद केसरी	(टी-II-3)
श्री तुलसी राम	(टी-II-3)
श्री पुलीन बिहारी सेन	(टी-I-3)
श्रीमती प्रभा देवी	(टी-I-3)
श्री हिरण्यमय दास	(टी-1)
श्री राजकुमार राय	(टी-1)
श्री शिशिल कुमार तिर्की	(टी-1)
श्री विनोद कुमार	(टी-1)

आंशुलिपिक

श्री अर्जुन कुमार सिन्हा

प्रौद्योगिकी हस्तांतरण विभाग

विभागाध्यक्ष
श्री रंगनादन रमणि

वरीय वैज्ञानिक
डा. अगस्त पाण्डेय (भौतिकी रसायन)

वैज्ञानिक (प्रवरण कोटि)
श्री यज्ञ दत्त मिश्र (कृषि कीट)

वैज्ञानिक (वरीय वेतनमान)
श्री आशीष कुमार दासगुप्ता (कार्बनिक रसायन)
श्री रजत कुमार बनर्जी (कार्बनिक रसायन)
श्री राधा सिंह (भौतिकी रसायन)
श्री महेश्वर लाल भगत (कृषि कीट)
डॉ. अनिल कुमार जायसवाल (कृषि कीट)
डॉ. केवल कृष्ण शर्मा (कृषि कीट)

प्रचार अधिकारी
श्री लाखन राम (टी-6)

तकनीकी अधिकारी
श्री रामचन्द्र मौर्य (टी-5)
श्री लालचन्द्र चुड़ामणिनाथ शाहदेव (टी-5)
श्री मौरिस एक्का (टी-5)
श्री कवल किशोर प्रसाद (टी-5)

प्रयोगशाला तकनीशियन
श्री उमेश्वर सहाय (टी-II-3)

फिल्ड/फार्म तकनीशियन
श्री अनिल कुमार सिन्हा (टी-II-3)
श्री राम लोचन राम (टी-II-3)
श्री शिव वचन आजाद (टी-2)

कलाकार-सह-छायाकार
श्री रमेश प्रसाद श्रीवास्तव (टी-II-3)

संग्रहालय सहायक
श्री रत्ना सेन (टी-II-3)

कनीय लिपिक
श्री राधा किशुन टोप्पो

क्षेत्रीय अनुसंधान केन्द्र, धर्मजयगढ़ (मध्य प्रदेश)

केन्द्र प्रभारी

वरीय वैज्ञानिक (कृषि कीट)

रिक्त

फिल्ड/फार्म तकनीशियन

श्री रणजित सिंह मालिया (टी-4)

श्री जीवन लाल (टी-I-3)

प्रयोगशाला तकनीशियन

श्री अजमेर हुसैन (टी-II-3)

क्षेत्रीय प्रक्षेत्र अनुसंधान केन्द्र, बलरामपुर (प. बंगाल)

केन्द्र प्रभारी

वरीय वैज्ञानिक (कृषि कीट)

रिक्त

फिल्ड/फार्म तकनीशियन

श्री सुनील कुमार मुखर्जी (टी-1)

श्री सतीश कुमार (टी-1)

क्षेत्रीय प्रक्षेत्र अनुसंधान, जसपुर (उड़िसा)

प्रभारी वैज्ञानिक

श्री यज्ञदत्त मिश्र (कृषि कीट)

फिल्ड/फार्म तकनीशियन

श्री दिलीप कुमार सिंह (टी-II-3)

श्री मदन मोहन (टी-1)

श्री संजय कुमार त्रिपाठी (टी-1)

हेसल प्रायौगिक लाख वीहन फार्म

प्रभारी वैज्ञानिक

डॉ. केवल कृष्ण शर्मा (कृषि कीट)

फिल्ड/फार्म तकनीशियन

श्री विनोद कुमार (टी-II-3)

श्री परवेज आलम अंसारी (टी-2)

प्रशासन

प्रशासनिक अधिकारी

रिक्त

सहायक प्रशासनिक अधिकारी

श्री नागेन्द्र महतो

अधीक्षक

श्री मोहम्मद सम्मीउल्लाह

श्री अनिल कुमार चौधुरी

वरीय आशुलिपिक

श्री रामेश्वर रविदास (निदेशक के निजी सहायक)

सहायक

श्री रामबरण सिंह

श्री कृष्णा नन्द सिन्हा

श्री रविशंकर

श्रीमती सती गुहा

वरीय लिपिक

श्री कानाई लाल चौधरी

श्री नुरजन टोपनो

श्री विजय राम

श्री वैजनाथ गोप

श्री वसन्त कुमार रजक

कनीय लिपिक

श्री नारायण गोप

श्री बिहारी साहु

श्री शरद चन्द्र लाल

श्री कामेश्वर प्रसाद आर्य

श्री अरुण कुमार त्रिपाठी

श्री कृष्ण कात्याल देवनाथ

श्री समल कुमार

वित्त एवं लेखा अनुभाग

सहायक वित्त एवं लेखा अधिकारी

श्री अशोक कुमार लाल,
(के. बा. प्र. के से अंश कालिक)

सहायक

श्री बुद्धन राम

वरीय लिपिक

श्री रजनी कान्त उपाध्याय
श्री इमिल गाड़ी
श्री सुदर्शन राम
श्री टिबु मिंज
श्री प्रह्लाद सिंह

कनीय लिपिक

श्री विलशन गुड़िया
श्री रघुनाथ महतो

क्रय अनुभाग

प्रभारी

श्री नागेन्द्र महतो, स. प्र. अ. प्रभारी

सहायक

श्री दुधेश्वर राम

कनीय लिपिक

श्री प्रणय कुमार

हिन्दी प्रकोष्ठ

सहायक निदेशक **(रा. भा.)**

श्री लक्ष्मी कान्त

हिन्दी अनुवादक

डॉ. अंजेश कुमार (टी-II-3)

निदेशक कक्ष

कृषि अनुसंधान आसूचना प्रणाली प्रकोष्ठ

श्री रमेश प्रसाद (टी-5)
श्री अमर कुमार सहाय (टी-5)
श्री दीपांकर गांगुली (टी-5)

वरीय लिपिक

श्री अनन्त पाण्डेय

फार्म इकाई

तकनीकी अधिकारी

श्री नरेन्द्र कुमार शर्मा (टी-6)
श्री रामानन्द वैद्य (टी-5)

फिल्ड/फार्म तकनीशियन

श्री हरदुगन भेंगरा (टी-4)
श्री मोहम्मद अली अंसारी (टी-II-3)
श्री विजय कुमार तिवारी (टी-II-3)
श्री सतीश कुमार (टी-1)

ट्रैक्टर ड्राइवर

श्री मरकुस सुरीन (टी-I-3)

पुस्तकालय

तकनीकी अधिकारी

श्री राम प्रताप तिवारी (टी-5)
श्री विनोद कुमार सिंह (टी-5)

कनीय लिपिक

श्री अर्जुन गोप

गुणवत्ता नियंत्रण (परीक्षण प्रयोगशाला)

तकनीकी अधिकारी

श्री दीपक घोष (टी-5)

श्री कुमार महेन्द्र सिन्हा (टी-5)

श्री जगदीश सिंह (टी-5)

प्रयोगशाला तकनीशियन

श्री युगल किशोर अम्बुज	(टी-2)
श्री अजय कुमार	(टी-1)
श्री अनुप कुमार	(टी-1)
श्री विरेन्द्र कुमार सिंह	(टी-1)

अनुरक्षण एवं कर्मशाला इकाई

तकनीकी अधिकारी

श्री संतोष कुमार श्रीवास्तव	(टी-5)
श्री स्वपन कुमार भादुड़ी	(टी-5)

यंत्र मेकानिक (यांत्रिक)

श्री हीरालाल भक्त	(टी-II-3)

टर्नर

श्री कंवर तिर्की	(टी-1)

व्यालर एटेंडेंट

श्री वलाई लाल डे	(टी-II-3)

बढ़ई

श्री अर्जुन शर्मा	(टी-1)

ग्लास ब्लोयर

श्री भानुराम सुखराम चौधरी	(टी-1)

वायरमैन

श्री रवीन्द्र कुमार रवि	(टी-1)

केन्द्रीय भण्डार

प्रभारी अधिकारी

डॉ. कृष्ण मोहन प्रसाद (वरीय वैज्ञानिक)

सहायक

श्री कुलदीप पाण्डेय

वरीय लिपिक

श्री मोहम्मद मुबारक

परिवहन

वाहन चालक

श्री बन्धना रूण्डा	(टी-I-3)
श्री जसवन्त तिवारी	(टी-1)
श्री नारायण लकड़ा	(टी-1)
श्री अरविन्द कुमार	(टी-1)

चिकित्सा इकाई

प्राधिकृत चिकित्सक (अंशकालिक)

डॉ. नारायण प्रसाद साहु, एम. डी.

स्टॉकमैन-सह-कम्पाउण्डर

श्री चन्देश्वर पाण्डेय	(टी-II-3)