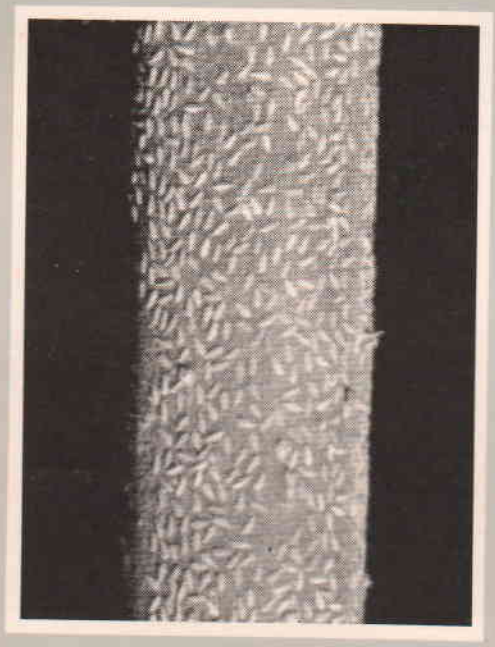
वार्षिक प्रतिवेदन
ANNUAL REPORT 1994-95



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भारतीय लाख अनुसंधान संस्थान
Indian Lac Research Institute
(भाकृअनुप : ICAR)
राँची, भारत : **Ranchi , India**

वार्षिक प्रतिवेदन 1994–95

Annual Report 1994-95

भारतीय लाख अनुसंधान संस्थान
Indian Lac Research Institute

(भारतीय कृषि अनुसंधान परिषद्)
(Indian Council of Agricultural Research)

नामकुम, राँची 834 010, भारत
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This report pertains to the period: April 1994 to March 1995. The co-operation rendered by various staff members in the preparation of the manuscript is thankfully acknowledged.

Cover Photo: Lac larvae on the shoot of *bhalia (Flemingia macrophylla)*, soon after settlement

Contents

INTRODUCTION

The Indian Lac Research Institute (ILRI) was started, on the basis of 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 1st 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 Entomology Division, Chemistry Division, Plant Sciences Section and Extension Division; the Administrative and Finance & Accounts Sections; the Library; the Technical and Monitoring Cell and the Mechanical Section; besides, the Dispensary and residential quarters. Adjoining this, is a small campus housing the Technology Section and the staff quarters. The Institute has play grounds in both the campuses. Adjoining the campuses, there is a 36.5 ha plantation for field experimentation. The Institute also has a Regional Field Research Station for Lac at Dharamjaigarh, M.P. The ILRI is a pioneer organisation devoted to researches on cultivation, processing and utilization of lac, which is mostly cultivated in an area of about 80,900 sq. km., by the tribals 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 everchanging requirements of the industry. The Institute has attained international recognition for its contribution in cultivation and utilization aspects of lac.

Objectives

- To conduct strategic and applied research for improvement in the production, processing and utilization of lac.
- To provide leadership for generating location-specific technology for management of improved production and processing of lac.
- To act as a centre for training in lac production, processing and utilization technologies by collaborating with State Govt. and industry.
- To act as a repository of information on the lac production, processing and utilisation.
- To collaborate with National and International agencies in achieving the above objectives.

Organisational Set-up

The Institute is headed by a Director. The scientific manpower is deployed under three divisions : Chemistry, Entomology and Extension; and two sections: Plant Sciences and Technology. The Administrative wing comprises of Director's Office, Administrative Section, Purchase Section, Finance and Accounts Section and Central Stores. The auxiliary units are : Hindi Cell, Security, Medical and Estate Maintenance Services. The technical support is provided by the following sections : Library, Farm Unit, Maintenance & Workshop and Technical & Monitoring Cell.

Staff

The Institute has a sanctioned strength of 56 scientific, 87 technical, 49 administrative, 14 auxiliary and 135 supporting grade posts.

Budget

During 1994-95, the non-plan expenditure was Rs 174.20 lakhs, against a budget estimate of Rs 140.00 lakhs; the plan expenditure was Rs 59.51 lakhs against a budget estimate of Rs 53.00 lakhs.

Research Highlights

Improved techniques for broodlac and sticklac production on kusum

Separate cultivation techniques have been developed for the production of broodlac and sticklac using *kusmi* lac insect on *kusum (Schleichera oleosa)* tree.

Control of lepidopterous predators of lac insect

The insecticides, cypermethrin and fenvalerate, were found safe to second instar lac insects at concentrations 0.00025-0.002%. These were earlier found to exhibit ovicidal activity on the major lepidopterous predators of lac insect.

Genetic variation in some growth attributes of bhalia (Flemingia macrophylla)

Some growth attributes of *bhalia,* which are of importance for lac culture, were studied. High values of heritability for the number of primary branches and total shoot length were obtained which can be exploited for genetic improvement through selection.

Lac culture on akashmani (Acacia auriculaeformis) *under a multistorey system*

Jethwi 1994 crop was successfully raised on *akashmani* with 600-800g scraped lac (sticklac) yield/plant. The harvested biomass (dry weight) from the twigs and leaves were 80 and 16 q/ha respectively.

Preparation of calcium salt of lac-dye for textile industry

Laboratory trial showed that calcium salt of lac-dye worked satisfactorily for dyeing wool.

Improved method of filtration for the preparation of aleuritic acid

With the use of calcium carbonate as filter aid, the filtration period of sodium

hydrolysate of seedlac could be reduced, improving overall economy of the process.

Lac Production

The institute maintains an experimental area of *kusum* trees, at Hesal, about 18 km away from the main campus. During the period under report, 2565 kg of broodlac was produced of which 2200 kg (Value: Rs 2,05,940) was utilised under various experiments; the remaining 365 Kg broodlac was sold at Rs 32,900. In addition, 508 Kg of scraped lac (sticklac, value: Rs 29,718) was also produced.

Award

Sri Maurice Ekka (T-4) of Chemistry Division was awarded M.Sc.(Ag) degree in Soil Science and Agricultural Chemistry of Birsa Agricultural University, Ranchi.

PROGRESS OF RESEARCH

DIVISION OF ENTOMOLOGY

Researches in progress

1.1 Improvement in lac cultivation techniques

1.1.9 To evolve management practices for *kusmi* lac insect for broodlac and sticklac production on *kusum* and *ber*

Y.D. Mishra and A. Bhattacharya

The projects 1.1.11 and 1.3.12 were merged with this project during the period.

To modify the management practices for brood and sticklac production on kusum

Experiment was carried out as per the technical programme (*Ann. Rep. 1990-92*), the yield obtained in various treatments were calculated as follows: i) broodlac as well as sticklac yields per pruned point, ii) broodlac yield per kg brood used for inoculation, iii) sticklac yield per kg sticklac (of the broodlac) used and iv) broodlac as well as sticklac yield per average-size tree (400 pruned points) (**Table 1**). The performance of broodlac was also estimated in terms of sticklac yield per metre brood used and percent living females in the brood lac produced. The results have been shown in **Table 2.**

The treatments KD, KE and KH were significantly superior to all other treatments with respect to sticklac and broodlac yields (Table 1). The brood lac produced under treatment KE was also superior compared to KD and KH, (Table 2) and hence can be recommended for brood production. This treatment comprises of four-coupe system with 20g brood per pruned point and combined spray of endosulfan (0.05%) and BHC (0.05%) on one-month-old lac crop, followed by a second spray during November/June for *aghani* and *jethwi* crops respectively. The sticklac yield per pruned point and in relation to the brood lac used was found to be the best in KH amongst all the treatments, and thus recommended for sticklac production. The treatment KH comprises of two-coupe system with 20g brood per pruned point, inoculation on one-year old shoots during June/July, partial harvesting in subsequent winter and complete harvesting in next June/July, with combined spray of endosulfan and BHC on one month-old crop in each crop season (*aghani* and *jethwi*).

To assess the economics of the management practices evolved, in relation to villagers' method

The experiment was laid out in R.B.D., with 5 treatments and 5 replications, using 100 *kusum* trees. The trees under the experiment, were pruned during June/July and December 1994.

Table 1 Lac crop yield on *kusum* under different management practices

Yield parameters	Yield (kg) under different treatments KA	KB	KC	KD	KE	KF	KG	KH	C.D. at 5%	C.D. at 1%
Brood lac yield/ pruned point	0.08	0.13	0.07	0.19**	0.19**	0.05	0.09	0.28**	0.06	0.08
Sticklac yield/ pruned point	0.060	0.105**	0.045	0.132**	0.135**	0.035	0.070	0.155**	0.043	0.059
Broodlac yield/kg brood lac used	3.80	4.80	2.67	9.42**	7.17	1.37	4.55	12.80**	4.60	6.26
Sticklac yield/kg stick lac obtained from broodlac	6.22*	6.30*	2.45	12.17**	10.12**	2.45	6.22**	14.05**	3.65	4.97
Brood lac yield per average tree	32.0	52.0	28.0	76.0**	76.0**	20.0	36.0	112.0**	26.0	35.6
Sticklac yield per average tree	26.0	42.0**	18.0	52.8**	54.0**	14.0	28.0	62.0**	17.2	23.6

Table 2 Quality of broodlac obtained under different manage ment practices adopted, on *kusum*

Parameter	Treatments KA	KB	KC	KD	KE	KF	KG	KH
Weight of sticklac (kg) per metre broodlac	0.650	0.675	0.500	0.700	0.800	0.600	0.650	0.700
Percent living females	60	65	50	70	80	60	55	70

1.1.10 Evolution of cultivation schedule on *akashmani* for growing *kusmi* and *rangeeni* crops

S.G. Choudhary, A.H. Naqvi and A. K. Sen

The project aims at evolving *kusmi* and *rangeeni* lac production techniques for *akashmani (Acacia auriculaeformis).* Field trials were repeated during the period under report as per the technical programme in *Ann. Rep. 1990-92.*

Pruning time and technique

Besides the pruning times mentioned in the *Ann. Rep. 1990-92,* pruning was also done during December. The most suitable period of pruning was Jan.-middle Feb. As reported earlier, the plants in low lying area did not respond well to pruning in July. This was due to incessant rains for about 3 months during the monsoon season resulting in water logging in the area. The shoots did not sprout up from the buds and 90% plants died, whereas in upland plots 85-90% of host plants survived and responded well to pruning.

Optimum brood rate and age of shoots for crop inoculation

For determination of optimum broodlac requirment and age of shoots for crop inoculation, different brood rates ranging from 10-30g/m were tried on 12,18 and 24 month-old shoots for raising *katki* (*rangeeni* strain) and *aghani* (*kusmi* strain) crops.

Density of larval settlement, sex ratio, fecundity and crop yield were recorded. The results of crop yield are presented in **Tables 3** and **4.** The best crop yields were recorded on 18-month-old shoots at 10-20 g/m brood rate.

Alternation of broodlac

Another experiment was carried out for evaluating the alternation of brood lac between *akashmani* and conventional hosts.

Broodlac from *akashmani* was used to raise *baisakhi* 1993-94 and *jethwi* 1994 crops on *palas* and *kusum* trees, respectively. Use of *akashmani* broodlac resulted in higher lac yields (17-21%) on both hosts, compared to those obtained using broodlac of same host.

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

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

This project was initiated during the period under report for i) improving lac crop management practices for sustained production of quality brood lac and maximising the yield of sticklac and ii) developing a method for estimation of broodlac requirement and expected yield for the conventional *rangeeni* lac hosts, *palas* and *ber.*

Techniques for *palas*

Maximising brood lac and sticklac yields

For improving the lac crop management practices, field trials were laid out with six treatments and three replications. Separate experiments were planned for the *katki* and *baisakhi*-cum-*katki / baisakhi* crops, with different treatments.

Table 3 Lac yield from *akashmani*, in relation to the brood rate and the age of shoots of host plant, during *katki* crop season

Rate of broodlac (g/m shoot length)	Age of shoot (month)	Brood lac used (g)		Yield obtained (g)			Brood used:yield	
		Lac sticks	Scraped lac	Broodlac sticks	Rejected lac sticks	Total scraped lac	In terms of lac sticks	In terms of scraped lac
T1 (10)	12	600	120	1350	300	145	1:2.2	1:1.2
T2 (15)		900	190	1850	250	230	1:2.1	1:1.2
T3 (20)		1200	240	2460	350	250	1:2.1	1:1.1
T4 (25)		1500	300	2850	350	300	1:1.9	1:1
T5 (30)		1800	360	3000	400	330	1:1.6	1:0.9
T1 (10)	18	600	125	1760	250	190	1:1.9	1:1.5
T2 (15)		900	180	2700	300	285	1:3.0	1:1.5
T3 (20)		1200	260	3850	350	570	1:3.2	1:2.1
T4 (25)		1500	310	4100	340	570	1:2.7	1:1.8
T5 (30)		1800	350	4160	360	460	1:2.3	1:1
T1 (10)	24	600	130	1700	200	170	1:2.8	1:1.3
T2 (15)		900	190	2250	250	270	1:2.5	1:1.4
T3 (20)		1200	250	3285	300	400	1:2.7	1:1.6
T4 (25)		1500	300	3300	300	450	1:2.2	1:1.5
T5 (30)		1800	360	2800	350	300	1:1.5	1:0.9

Table 4 Lac yield from *akashmani*, in relation to brood rate and the age of shoots of host plant, during *aghani* 1994-95 crop season

Rate of broodlac (g/m shoot length)	Age of shoot (month)	Brood lac used (g)		Yield obtained (g)			Brood used:yield	
		Lac sticks	Scraped lac	Broodlac sticks	Rejected lac sticks	Total scraped lac	In terms of lac sticks	In terms of scraped lac
T1 (10)	12	200	60	550	150	160	1:2.7	1:2.6
T2 (15)		300	80	850	200	230	1:2.8	1:2.8
T3 (20)		400	100	970	240	290	1:2.4	1:2.9
T4 (25)		500	150	900	250	220	1:1.8	1:1.4
T5 (30)		600	170	850	230	190	1:1.4	1:1.1
T1 (10)	18	200	60	900	200	240	1:4.5	1:4.0
T2 (15)		300	80	1080	230	300	1:3.6	1:3.7
T3 (20)		400	90	1560	270	360	1:3.9	1:4.0
T4 (25)		500	140	1350	250	300	1:2.7	1:2.1
T5 (30)		600	180	960	250	230	1:1.6	1:1.2
T1 (10)	24	200	70	650	250	210	1:3.2	1:3.1
T2 (15)		300	90	840	200	240	1:2.8	1:2.6
T3 (20)		400	110	1060	300	270	1:2.6	1:2.7
T4 (25)		500	140	950	260	230	1:1.9	1:1.6
T5 (30)		600	190	1050	300	250	1:1.7	1:1.3

Pruning technique and brood requirement

Response to light and heavy pruning techniques using apical and basal methods was studied. The no. of pruned points were counted; the no. and length of shoots appearing after pruning, spread of canopy, girth of trees were also measured. Effect of five brood lac rates (10-30 g/m), on lac yields was also studied.

Techniques for *ber*

Maximising brood lac and sticklac yields

As for *palas*, seperate experiments were planned for the *katki* and *baisakhi* / *baisakhi*-cum-*katki* crops. In the former, there were six treatments and in the latter, four treatments, with three replications each.

Pruning technique and brood requirement

Response of *ber* to different pruning techniques was studied as outlined above for *palas*. Similarly, study on the effect of six brood lac rates (5-30g/m) on the larval settlement, survival at initial and crop maturity stages, sex ratio and yield was also made. Villagers' technique of pruning (heavy) and lac cultivation were also included, for comparison.

For conducting above experiments, field layout was done in RBD in the institute plantation; both *palas* and *ber* trees were numbered and divided into different coupe. Trees were pruned during April and February and the total inoculable area was measured and inoculation for *baisakhi* 1994-95 and *baisakhi*-cum-*katki* 1994-95 crop was done during Oct.'94. Spraying was done during first fortnight of December and samples were collected before and after the treatment for examination. The crops on *palas* as well as on *ber* were developing satisfactorily.

The number of pruned points was counted and lengths of shoots sprouting up from each pruned point were measured. The results indicated that the total inoculable area, obtained after heavy pruning, i.e., under villagers' practice was found to be more, compared to (apical) light pruning technique.

A positive correlation was found between the no. of pruned points and total inoculable area both in *palas* and *ber* after normal pruning. But in *ber*, though the no. of pruned points after heavy pruning (villagers' method) was less as compared to light pruning, the no. and the total length of shoots sprouted were more **(Table 5)**.

Table 5 Response to two methods of pruning, in *ber*

Pruning Technique	Pruned points (no.)	Shoots sprouting up (no.)	Length of the shoots (m)
Light pruning	84	172	227
Heavy prunig	65	209	377

1.4 Control of enemies of lac insect

1.4.20 Screening and evaluation of pesticides and application of certain new techniques for management of insect pests and diseases of lac

A. Bhattacharya, A.H. Naqvi, S.G. Choudhary, Y.D. Mishra, M.L. Bhagat and B.S. Rayudu

Screening of synthetic pyrethroid insecticides for their safety to the lac insect

In view of the results obtained last year, the experiment was repeated after including two lower concentrations (0.00025 and 0.0005 per cent) of cypermethrin and fenvalerate, and endosulfan (0.05 percent), the recommended insecticide for control of the predators. The experiment was conducted in R.B.D., with ten treatments and three replications. Each treatment consisted of three *kusum* bushes. Lac insect colonies (second instar) growing on *Schleichera oleosa (kusum)* bushes were sprayed, during *aghani* 1994-95 crop season, with four concentrations of synthetic pyrethroids, one concentration of endosulfan and water (control), after estimating the density of living lac insect population on the bushes under trial. Mortality counts of the lac insects were made 7 and 14 days after spraying and the percentage of male insect population was also recorded subsequently.

Table 6 Lac insect mortality and male percentage after spraying of insecticide on second instar lac insect colonies

Treatment/ Concentration of insecticide (%)	Average (%) mortality		Average percentage of males
	7 DAS*	14 DAS	
Cypermethrin			
0.00025	5.61	7.98	26.78(20.43)
0.0005	7.58	6.67	28.77(23.47)
0.001	7.55	9.12	28.80(23.31)
0.002	7.65	5.85	28.49(23.10)
Fenvalerate			
0.00025	5.17	6.47	25.31(18.32)
0.0005	8.25	7.19	29.07(23.76)
0.001	6.17	6.97	27.26(21.26)
0.002	9.25	6.96	26.41(20.20)
Endosulfan			
0.05	5.64	7.82	22.68(15.11)
Water (Control)	6.39	7.58	30.90(26.54)
C.D. at 5%	N.S.	N.S.	N.S.

* DAS- Days after spraying

** Data transformed into degrees ($P=Sin^2\theta$)

Figures in parentheses are original values

The results clearly show that different concentrations of the insecticides under trial are safe to lac insect (**Table 6**).

Evaluation of safe insecticides for their ovicidal activity on the eggs of lac predators, Eublemma amabilis *and* Pseudohypatopa pulverea.

Consequent upon the above findings, the insecticides were evaluated against different age groups of eggs of both predators for their ovicidal activity.

The eggs laid on paper strips, under laboratory conditions, were dipped in various concentrations of insecticidal emulsions for 30 seconds, air dried and kept under observation for recording the hatching. The control eggs were dipped in water.

Eublemma amabilis : The experiment consisted of twelve treatments and three replications. Each treatment consisted of 20 eggs. The percent hatching of eggs under different treatments presented in **Table 7**. The embryos were found to develop within the eggs under all the treatments. It was observed that in few treated eggs the fully developed larvae could cut the chorion partially but were unsuccessful in coming out. In few cases the larvae could protrude their heads only.

Table 7 Effect of insecticides on the hatching of eggs of *Eublemma amabilis*

Treatment/ Concentration (%)	Average percent inhibition in hatching of treated eggs		
	0-48 HOE*	48-96 HOE	96-144 HOE
Cypermethrin			
0.00025	96.67	83.34	76.67
0.0005	100.00	86.67	96.67
0.001	100.00	100.00	100.00
Fenvalerate			
0.00025	100.00	100.00	88.34
0.0005	100.00	100.00	100.00
0.001	100.00	100.00	100.00
Endosulfan 0.05	100.00	100.00	100.00
BHC 0.05	100.00	70.00	56.67
Cypermethrin (0.0005)+ Endosulfan(0.05)+ BHC (0.05)	100.00	100.00	100.00
Fenvalerate (0.0005) +Endosulfan (0.05) +BHC (0.05)	100.00	100.00	100.00
Endosulfan (0.05) +BHC (0.05)	100.00	100.00	100.00
Water (Control)	21.67	20.00	6.67

* HOE : Hour-old egg.

All the insecticides of all concentrations tested caused significant inhibition of egg hatching. Fenvalerate was found stronger than cypermethrin. Combination of the insecticides tried caused cent per cent mortality.

Study of egg laying of E. amabilis *on insecticide treated surfaces and hatching of laid eggs*: Freshly cut twigs (15 cm) of *bhalia* were dipped in emulsions of 0.001 percent cypermethrin and fenvalerate for 2 minutes, dried and offered to caged adult moths of *E. amabilis* in battery jars. The control twigs were dipped in water. The set-up was left as such for 2-3 days under observation for hatching of eggs.

The adult moths laid eggs on both treated and untreated surfaces. There was cent per cent inhibition in hatching of eggs on the pyrethroid treated surfaces; embryos had developed in all the eggs.

Pseudohypatopa pulverea : The methodology used was similar to that reported above for *E. amabilis,* but only 3-4-day-old-eggs were used in the experiment. The eggs were treated with 0.0005 % cypermethrin, fenvalerate, deltamethrin and water (control).

It was observed that treatment with these insecticides caused cent per cent inhibition in egg hatching, due to mortality of developing embryos. Hatching in the case of control was cent per cent.

Effect of brood treatment on the coverage and survival of lac insect

Broodlac obtained from *jethwi* 1994 crop was dipped in aqueous emulsions of 0.00025, 0.0005 and 0.001 percent cypermethrin and fenvalerate for two min., dried and inoculated on *bhalia* bushes for raising *aghani* 1994-95 crop. The control brood was dipped in water. Samples were drawn at one-month stage to observe the survival of the lac insect. For observing the effect on coverage, the total lac encrustation were measured. Dipping of broodlac in the insecticide emulsions did not affect the survival and the coverage of the lac insects(**Table 8**).

Table 8 Effect of treatment of broodlac on coverage and survival of lac insects

Treatment/ Concentration (%)	Average coverage (%)*	Average mortality (%)
Cypermethrin		
0.00025	38.65 (39.68)	10.43
0.0005	39.33 (40.26)	11.57
0.001	39.22 (40.22)	10.11
Fenvalerate		
0.00025	42.95 (46.49)	10.33
0.0005	40.02 (41.54)	14.56
0.001	44.09 (48.51)	14.69
Control (Water)	42.01 (44.87)	9.46
C.D. at 5%	N.S.	N.S.

* The values are Arc. sin $\sqrt{\text{percentage}}$. Original values are within parentheses.

Screening of probable repellents and their possible use in management of lac predators

The experiment was carried out in R.B.D., on *bhalia* bushes during the *aghani* 1994-95 crop season in the Institute plantation. Lac insect colonies were raised on a number of *bhalia* bushes and 20 randomly selected bushes were taken for experimentation. One natural alkaloid (asafoetida) and three chemicals (napthalene, Odonil and formaldehyde)

were used in the experiment. Considerable gap was maintained between the experimental bushes to avoid the overlapping effect of odoriferous substances. Each of the above mentioned odoriferous substances were tied with the help of perforated synthetic nets/ vials on four bushes each, just after *phunki* removal stage. Four bushes left as such served as control. Samples of lac encrustations were drawn at intervals of one week for assessing the predator population. The data have been given below :

Treatment	Average predator population per metre of lac encrustation
Napthalene	3.74 (14.59)
Asafoetida	2.20 (4.01)*
Odonil	3.75 (14.01)
Formaldehyde	2.31 (4.61)*
Control	3.94 (15.06)
C.D. at 5%	1.32

Data subjected to treatment : $\sqrt{n+1}$. Original values are within parentheses

* Significant.

Asafoetida and formaldehyde were found to have significant repellent action against the target predators. They did not adversely affect the presence of ants, which are beneficial symbiotic associates. Lac insect colonies in all the treatments were found to be healthy.

Study of the population fluctuations of lac-associated fauna for determining the period of incidence

Aghani 1994-95 crop was raised on *kusum* trees in the Institute plantation. Five random samples of lac encrustations were drawn at 20 days interval from 5 *kusum* trees. The method adopted for sampling the trees was by cutting lac encrusted twigs, from four directions and three canopy levels. The twigs were then mixed together and random four metre shoot length was drawn and caged in wooden parasite boxes fitted with glass tubes. The daily emergence of parasites and predators from each of the 5 parasite boxes were recorded.

Three lac insect parasites, viz., *Tetrastichus purpureus, Tachardiaephagus tachardiae* and *Coccophagus tschirchii*, two predators, *Eublemma amabilis* and *P. pulverea,* and two beneficial parasites, *Pristomerus sulci* and *Apanteles tachardiae* have been recorded in abundance during the whole life cycle of the lac crop.

The parasite *T. purpureus* made its appearance at the end of six weeks of inoculation, i.e., during the third instar of the host lac insect. The peaks of emergence were recorded at the 7th, 9th, 12th, 16th and 21st weeks. The peaks showed gradual increase, indicating increasing abundance of the parasites in the crop.

T. tachardiae showed its appearance in the 7th week with peaks in the 8th, 10th, 14th and 19th weeks with gradual decreasing tendency which clearly indicated its incidence during the onset of rains.

If the peaks are any indication of the life period of the parasites, the lac insects must have been parasitized just after the first moult, i.e. at 21 day stage, and the parasites must have completed their life cycle within the next 2-3 weeks, so as to emerge at the 6th-7th week stage of the host. The gradual increase in the

intervals between the two peaks indicate the effect of availability of food and abiotic factors such as temperature, humidity, photoperiod etc.

Rearing of P. pulverea *larvae on artificial diets in the laboratory*

P. pulverea was allowed to lay eggs under lab. conditions. The newly hatched larvae from these eggs were released on four types of artificial diets, viz., Cerelac (wheat-vegetable), Cerelac (wheat-soya), Bonus and Bonus+Cerelac (wheat vegetable) kept in glass petri dishes. The larvae fed on different diets, formed galleries while feeding, moulted and ultimately emerged as adults. The number of instars and the developmental period (larva-adult) on different diets are given in **Table 9**.

The insect completes its life period (larva to adult) within a range of 51 to 70 days with 5 instars on different compositions of Cerelac (wheat-vegetable) in high humid conditions during July/August/September.

Table 9 Life duration and instars of *P. pulverea* larvae reared on artificial diets

Diet	Date of start of hatching	Developmental period (days) (larva-adult)	Number of instars
Bonus	29/7/94	61-121	7-8
	10/8/94	240	9
Bonus+Cerelac (wheat vegetable)	1/8/94	52-70	5
Cerelac(wheat vegetable)	28/7/94	51-66	5
Cerelac(wheat-soya)	9/8/94	75	7
	18/9/94	201-206	9

The winter generation of *P.pulverea* takes a long duration of 201 to 206 days and passes through nine larval instars.

1.5 Genetics and breeding of lac insects

1.5.8 To collect, conserve and characterise lac insect germplasm and breeding superior lac insects for colour and resin productivity

R. Ramani and S.K. Jaipuriar

The project 1.5.13 was merged with this project during the period.

A new *rangeeni* stock, originating from Balrampur, West Bengal was added to the existing collection of lac insect germplasm at the institute. Maintenance of the following eleven stocks, from different regions of the country was continued :

Rangeeni	*Kusmi*
Malibasantpur Yellow	Orissa Yellow
Malibasantpur Crimson	Madanpur
Ghotari Yellow	Taimara
Balrampur	Namkum
Turhamu	
Kundri	
Local Yellow	

The life-period of the Mali Basantpur stock during the *baisakhi* 1993-94 season was longer (252 days) than normal; but, during the *katki* 1994 season, it was shorter (111 days). The Madanpur stock showed a normal life-period during the *jethwi* 1994 season, but during the *aghani* 1994, it was short (162 days).

The physico-chemical properties of the lac produced by Taimara (*aghani* 1993-94), Madanpur (*aghani* 1993-94), Mali Basantpur yellow (*baisakhi* 1993-94) and Turhamu (*baisakhi* 1993-94) stocks were studied. The lac derived from the Taimara stock was found to

exhibit superior life and flow (50 min and 70 mm respectively) compared to other stocks.

A pure line of the cream mutant of the *rangeeni* lac insects was developed. The F_2 generation (*baisakhi* 1993-94) of the cross between crimson female and cream male had all shown a wild crimson phenotype, whereas that of the reciprocal cross, has shown segregation into wild-type and cream insects. In the former cross, segregation of wild-type and cream insects, in both sexes, occurred in the F_3 generation (*katki* 1994).

The above results further confirm that the *cream* gene is recessive to the wild allele producing normal resin and body colour. Scoring of these insects for the colour could not be done as heavy mortality of these insects occurred due to incessant rains.

The segregating lines of the *kusmi* x *rangeeni* crosses were practically lost during the period under report due to incessant rains during the monsoon.

An experiment was carried out to study the variation in the lac productivity of individual female lac insects, using field bushes of *bhalia* (*Flemingia macrophylla*) as host. Lac insect cultures of Kundri *rangeeni* wild stock and an inbred line were set up during the *katki* crop season. Mature healthy females were collected and the cell weights determined. Study of the data collected from four cultures of each line showed that the cell weight varied widely among the cultures, in both the lines; the ranges were: 3.55-14.46 mg and 2.35-14.91 mg for the inbred and the wild lines respectively. The mean and the variance were not significantly different among the lines.

Ad hoc study

Evolution of early maturing *kusmi* variety through mass selection

Y.D. Mishra

Mass selection was continued in the fifth and sixth generations and a resultant variety having 158 day *aghani* and 200 day *jethwi* cycles as compared to the normal 210 day *aghani* and 160 day *jethwi* cycle, has been obtained. The new variety obtained is being evaluated for its performance on *palas, kusum* and *ber*.

SECTION OF PLANT SCIENCES

Research completed

2.2.6 Survey of genetic variation in lac potential of host plant

S.C. Srivastava, Y. D. Mishra and P. Kumar

The project was initiated with a view to survey the genetic variation in lac potential and plant parameters of the fast growing host plants, *bhalia (Flemingia macrophylla)* and *galwang (Albizzia lucida)*. The study comprised of i) standardising methods for vegetative multiplication of the host plants through stem cuttings and air-layers and ii) estimating the environmental and genetic components of the total variance in the lac potential and certain plant growth attributes of these hosts.

Twenty parent stocks were used for each host species, for vegetative propagation and for the study of genetic variation.

Survey of genetic variation in galwang

The trial for raising *galwang* plants through stem cuttings from twenty plants with the use of aqueous solution of IBA+IPA (100ppm) was initiated in the year 1985. Till 1988, the maximum success was only 33%, not adequate for multiplication of plants for desired experimentation. Attempts were, therefore, initiated to propagate this host through air-layering in 1988-89. The hormones IAA,IBA,NAA were tried individually and in combination of the two at 50 and 100 ppm. Best results (93.3%) were obtained when air-layering was done in June 1988 using IAA+NAA in equal proportion (100ppm) with green moss+lanolin paste as rooting medium. Similarly, in 1989-90, 60% air-layers showed root initiation with the treatment of IAA (100ppm) using lanolin paste + *Sphagnum* moss. The survival of air-layers transplanted in pots was 46.7%, upto March'90. In 1990-91, cent percent rooting was observed with the application of IAA+IBA and IAA+IPA (50ppm) alongwith lanolin paste and green moss; the branches used varied in girth between 1.86-2.86cm and in length, 122-218cm.

During 1990-91, in another experiment, 80% rooted air layers were observed with the application of NAA(50ppm) individually or in combination of IBA+NAA (50ppm) using a cheaper rooting medium comprising of mud+FYM(1:1) and dried *Saccharum* grass instead of green moss and lanolin paste; branches of 2.0-2.9cm girth and 122-212cm length were used. Among the rooting media tried, green moss+lanolin paste gave better results in general than pond soil+dried *Saccharum* grass.

Survey of genetic variation in bhalia

Twenty parent stocks of *bhalia* were selected at random from the Institute farm and sufficient no. of plants were raised from each, during June 1986 through stem cuttings (22cm long) after treating with a mixture of NAA+IPA (50ppm) for 24h. The survival percentage

of stem cuttings was 56.25 - 96.15%. The plants thus raised were transplanted under R.B.D. with 20 treatments and 4 replications. The experiment was carried out during 1986--1994-95. **Table 10** includes only the significant heritability estimates obtained for various parameters (lac host and insect) during the study. The estimates of heritability for number of primary branches/bush and total shoot length/bush were significant in 1988-89 and 1989-90 whereas for other characters, they were significant only in one year (Table 10). Thus it was concluded that no. of primary branches and total shoot length per bush may be considered as important parameters in formulating the selection programme.

Researches in progress

2.1 Propagation and management of lac host plants

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

B.P.Singh, P.Kumar and S.C.Srivastava

The projects, i) 2.1.11 Scheduling of lac cultivation under multistoreyed system and ii) 2.1.12 Management of *kusrunt (F. strobilifera)* were combined into a single project with modified title.

Scheduling of lac cultivation under multistoreyed system

This experiment was continued under rainfed condition with a view to evaluate different combinations of lac hosts under a multistoreyed system to build up a lac host plantation for sustained production of brood lac on *kusum* and sticklac production on other hosts like *akashmani, ber, bhalia, galwang* and *khair*. The spaces in between lac hosts will be utilized for growing upland crop (*Gora* paddy).

Table 10 Significant heritability estimates obtained for the plant attributes of *F. macrophylla* and the lac insect parameters (*Aghani* crop)

Plant attributes	Year	Heritability (%)
Plant height (cm)	1988 - 89	41.21*
No of primary branches/bush	1988 - 91	51.46-56.19**
Girth of internode (cm)	1992 - 93	32.32*
Length of internode (cm)	1987 - 88	51.81**
No. of inoculable tillers/bush	1990 - 91	54.72**
Canopy spread diameter/bush (m)	1994 - 95	56.53**
Length of shoot used by lac larvae/bush (cm)	1990 - 91	47.08*
Length of shoot/bush (m)	1988 - 90	40.81-60.8**
Larval mortality/cm	1989 - 90	22.37**

* Significant at 5% ** Significant at 1%

Observations on plant growth attributes of different lac hosts raised under the system and harvested biomass obtained from *akashmani, bhalia* and *galwang* during harvesting/coppicing have been shown in **Table 11**. The perusal of the data revealed that plant height and plant girth were maximum in *galwang* followed by *ber* for height and *khair* for girth. However, percentage increase in these characters over previous year were maximum in *kusum*. Observation recorded before lac inoculation indicated that *bhalia* bushes coppiced during Jan'94 failed to attain its previous year height and girth whereas *galwang* coppiced in Feb. '94 also could not attain its previous year height only. However, on an average, 21.05% increase in plant girth of *galwang* was observed (Table 11). *Jethwi* 1994 lac crop on *akashmani*, harvested towards the end of June'94 yielded on an average 600-800g sticklac/plant. During the course of harvesting/coppicing, the biomass (dry wt.) of twigs and leaves was maximum from *akashmani* followed by *bhalia* (Table 11). *Bhalia* bushes inoculated in June'94 to raise *aghani* 1994-95 lac crop did not produce satisfactory yield due to poor settlement and heavy mortality of lac larvae because of incessant rains through out the season. Growth of harvested/pruned *akashmani* plants was also affected adversely due to heavy and continuous rains and consequently the plants dried up. Intercrops could not be raised due to technical difficulties. *Galwang* bushes were inoculated with *kusmi* strain of lac to raise *Jethwi* 1995 lac crop, only under the treatment *kusum+bhalia+galwang+* intercrop.

Table 11 Growth parameters and harvested biomass (dry wt.) of lac hosts under different treatments

Treatments	Host species	Plant height (cm)	Increase in plant height over previous year (%)	Plant girth (cm)	Increase in girth over previous year (%)	Harvested biomass (dry wt.q/ha)	
						Twigs	Leaves
Kusum	*Kusum*	90.62	13.40	8.45	31.21	-	-
Kusum+ Intercrop	*Kusum*	83.09	17.13	6.89	31.74	-	-
Kusum+Akashmani	*Kusum*	116.52	18.25	8.36	23.12	-	-
+Intercrop	*Akashmani*	-	-	-	-	80.04	15.69
Kusum+Ber	*Kusum*	84.09	18.20	6.02	30.58	-	-
+Intercrop	*Ber*	191.29	7.72	8.68	19.39	-	-
-Kusum+Bhalia	*Kusum*	95.94	21.98	8.00	6.10	-	-
+Intercrop	*Bhalia*	161.35	3.51	4.10	(-) 2.61	17.62	1.35
Kusum+Galwang	*Kusum*	89.00	21.09	8.42	28.94	-	-
+Intercrop	*Galwang*	217.15	(-)18.57	23.38	20.20	13.86	1.17
Kusum+Khair	*Kusum*	65.58	13.07	5.63	31.85	-	-
+Intercrop	*Khair*	173.99	8.03	13.45	16.65		
Kusum+Bhalia	*Kusum*	89.02	21.71	6.85	28.76	-	-
+Galwang+	*Bhalia*	156.25	(-)2.80	4.42	(-)3.28	22.31	1.71
Intercrop	*Galwang*	224.49	(-)9.76	22.04	21.90	9.89	0.83

Effect of height of coppicing and NP fertilizers on the growth of kusrunt (F. strobilifera) *and lac yield*

This experiment was continued as per technical programme. *Kusrunt* plants, were coppiced in Jan'94 at the height of 10 and 15 cm above the ground level. The growth of the bushes was slow and proper shoots for inoculation during June-July'94 could not be obtained inspite of application of fertilizer. Data recorded on plant growth attributes indicated that plant height and girth were affected by coppicing height and fertilizer application. Plants coppiced at 15cm above ground level produced 5.83 and 8.42 per cent more plant height and girth respectively than when coppiced at 10 cm. The maximum plant height (95.85cm) was observed in the treatment plot applied with 40kg P_2O_5/ha while plant girth was maximum in the treatment plot applied with 40kg N+40kg P_2O_5/ha. *Kusrunt* bushes were fertilized as per treatment details in Jan'95 and no coppicing was done. The bushes will be inoculated in the month of June-July '95 to raise the *aghani* crop.

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

B.P.Singh, P.Kumar and S.C.Srivastava

The project aims to develop suitable techniques for raising *akashmani* plantation and for maximising the growth of the plant to make it ready for lac cultivation in shortest possible time.

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

The experiment was laid out in split-plot design as per details given below :

Main-plot treatments (planting spacing)

S_1 = 2m x 1.8m
S_2 = 3m x 2.7m
S_3 = 4m x 3.6m

Sub-plot treatments (fertilizers)

Fo = No fertilizer (control) ($N_0P_0K_0$)
F1 = 25g N + 50g P_2O_5 + 10g K_2O/plant/year
F2 = 50g N + 100g P_2O_5 + 20g K_2O/plant year
F3 = 75g N + 150g P_2O_5 + 30g K_2O/plant/year

There were 12 treatments replicated 3 times. In the first phase, the seedlings raised in nursery were transplanted in 372 well prepared and fertilized pits as per technical programme during the monsoon of 1994.

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

The experiment was laid out in split-plot design as per the details given below:

Main-plot treatments (coppicing height)

Co = No coppicing (Control)
C_1 = 30cm above the ground
C_2 = 60cm " " "
C_3 = 90cm " " "

Sub-plot treatments (fertilizers)

F_0 = No Fertilizers, (No PoKo) (control)
F_1 = 30g N + 40g P_2O_5 + 20g K_2O/plant/year
F_2 = 60g N + 80g P_2O_5 + 40g K_2O/plant/year
F_3 = 120g N + 160g P_2O_5 + 80g K_2O/plant/year

There were 16 treatments replicated 4 times. In the first phase, the seedlings

raised in nursery were transplanted in 320 well prepared and fertilized pits during the monsoon of 1994.

2.2 Genetics and breeding of lac host plants

2.2.7 Collection, maintenance, evaluation and characterisation of lac hosts

P. Kumar, S.C. Srivastava and S.K. Jaipuriar

The host plants *Flemingia macrophylla, F. semialata, F. paniculata* and *F. macrophylla* (colchiploid) raised earlier were inoculated in Oct-Nov. to raise *baisakhi* 1994-95 crop. The data recorded on the economic attributes of lac insect (**Table 12**) revealed that highest (54%) larval mortality was recorded in colchiploid plants of *F. macrophylla* and lowest (35%) in *F. semialata*. Highest percentage of male (46%) was found in *F.paniculata* and lowest (36%) in colchiploid of *F. macrophylla*. The data recorded for plant growth attributes showed the best performance of 163.3cm for plant height in *F. paniculata*, 65.6cm for canopy spread in *F. macrophylla,* 960.3cm for total shoot length in *F. macrophylla* (Table 12).

Further, the bushes of *F. semialata* inoculated for raising *jethwi*'95 and *baisakhi* 1994-95 crops were growing satisfactorily. *Aghani* 94-95 crop raised on *F. semialata* showed an average brood lac yield of 270 to 400g per bush and the average stick lac yield of 90 to 210g per bush.

The data recorded during *baisakhi* 1993-94 crop (Table 12) revealed that the maximum yield of brood lac was obtained on *F. paniculata* (33.1g/bush) and that of stick lac, on *F. semialata* (151.3g/bush).

In the course of evaluation of twelve accessions of pigeonpea, *(Cajanus cajan)* collected from ICRISAT, Hyderabad raised in RBD with 3 replications, it was found that the number of inoculable branches/plant was highly significant among all the characters studied (**Table 13**). The accession no. 8869 showed maximum number of inoculable shoots/plant and total shoot length. The canopy spread and the length of internode (6th)was maximum in Accession no. 8094. The plant height and shoot girth were maximum in Accession no. 9150 (Table 13). Further study is in progress.

Besides above, the seeds of ten pedigrees of *Flemingia* were collected from ICRISAT, Hyderabad. These seeds were grown in nursery beds as well as in polythene bags in April and the seedlings were transplanted in field condition during July-August'94 in RBD with four replications for their evaluation. Maximum plant height, girth and shoot length were recorded from ICPW 192, ICPW 203 and ICPW 204 (**Table 14**). The study is in progress.

Table 12 Growth attributes of different *Flemingia spp.* and economic attributes of lac crops raised on them

Treatment	Plant height (cm)	Girth at 6th node (mm)	Length of 6th internode (cm)	Canopy spread (cm)	No. of inoculable shoots	Total shoot length (cm)	*Baisakhi* 1993-94 Brood lac yield/bush (g)	*Baisakhi* 1993-94 Sticklac yield/bush (g)	*Baisakhi* 1994-95 Larval mortality (%)	*Baisakhi* 1994-95 Male (%)
F. macrophylla	158.3	12.6	6.3	65.6	8.4	960.3	24.5	148.2	43.0	37.0
F. semialata	147.3	14.2	6.0	48.6	7.8	865.0	21.3	151.3	35.0	38.0
F. paniculata	163.3	13.4	6.2	45.0	7.4	771.0	33.1	145.6	41.0	46.0
F. macrophylla (Colchiploid)	125.3	13.8	6.0	43.3	5.0	390.8	27.5	134.2	54.0	36.0

Table 13 Growth attributes of different accessions of *arhar*

Treatment (Accession no.)	Plant height (cm)	Length of 6th internode (cm)	Canopy spread (cm)	No. of inoculable shoots	Shoot length (cm)	Girth (mm)
9150	173.0	4.4	43.9	5.8	400.6	14.2
7613	134.0	3.26	45.3	6.9	423.3	8.4
8094	154.3	6.9	65.6	6.1	464.0	12.4
8859	137.0	3.2	39.0	5.1	791.0	10.0
8861	150.0	4.2	53.6	6.8	463.3	12.9
8862	144.6	3.6	59.6	6.2	478.0	14.0
8869	161.7	3.5	52.6	8.5	842.3	14.1
13153	166.6	3.8	36.3	5.4	383.6	12.3
11288	170.0	4.8	52.2	7.6	580.6	13.6
11296	144.7	3.5	41.3	4.2	274.0	11.3
13092	171.0	4.4	49.6	7.2	516.3	13.6
13326	141.3	3.4	47.0	4.2	231.3	13.1
CD 5%	-	-	-	1.83	-	-

Table 14 Growth attributes of accessions of *Flemingia* spp. obtained from ICRISAT, Hyderabad

Acc No.	Pedigree	Plant height (cm)	Plant girth (cm)	Total shoot length (m)
ICPW 192	*F. bracteata*	117.6	1.35	17.15
ICPW 193	*F. macrophylla*	57.8	0.62	9.35
ICPW 194	*F. macrophylla*	50.9	0.62	8.67
ICPW 196	*F. macrophylla*	64.4	0.77	8.72
ICPW 198	*F. macrophylla*	71.1	0.75	10.92
ICPW 200	*F. paniculata*	59.2	0.62	7.65
ICPW 201	*F. semialata*	51.8	0.60	9.32
ICPW 202	*F. stricta*	59.6	0.92	6.35
ICPW 203	*F. strobilifera*	85.3	1.42	18.10
ICPW 204	*F. strobilifera*	75.7	0.92	21.75
CD at 5%		10.64	0.18	3.14

DIVISION OF CHEMISTRY

Researches in progress

3.2 Fine chemicals from lac

3.2.15 Synthesis of isoambrettolide/ exaltone and plant growth regulator (PGR) from aleuritic acid

R.N. Majee, N. Prasad, I. Rajendran, P.C. Sarkar and S.C. Agarwal

Synthesis of isoambrettolide

Method I

Preparation of 16-hydroxy-hexadec-*trans*-9-enoic acid: The compound was prepared adopting two procedures, given below:

(i) 16-hydroxy-hexadec-*trans*-9-enoic acid, (m.p.,69-70°C; yield 90%) was prepared from *threo*-aleuritic acid (m.p. 99-100°C, 25g) by treatment with ethylorthoformate/benzoic acid followed by aqueous-alkaline hydrolysis and acidification.

(ii) 16-Hydroxy-hexadec-*trans*-9-enoic acid was also obtained (m.p.69-70°C; yield,50%) from *threo*-aleuritic acid (m.p. 99-100°C,5g) by treatment with phosphonium iodide in glacial acetic acid on steam bath for 4h followed by alkaline (alcoholic) hydrolysis and acidification.

Cyclisation : 16-Hydroxy-hexadec-*trans*-9-enoic acid (m.p.69-70°C, 35g) was dissolved in toluene (1750ml) containing *p*-toluene sulphonic acid (3.5g) and heated under reflux for 8h under an azeotropic head to remove water. Toluene was then distilled off and the residue was taken up in benzene, washed with water and dried over Na_2SO_4. Removal of solvent afforded the polyester as residue (33g); which was depolymerised by distilling it with anhydrous $MgCl_2$(0.9g). The distillate was dissolved in ether, washed sequentially with Na_2CO_3 solution (5%), water and dried (Na_2SO_4). Removal of the solvent gave crude *trans*-isoambrettolide (about 20g) which was distilled under reduced pressure. The compound had musk-like odour. IR: 1731.8(macrocyclic lactone), 971.92 (*trans* HC = CH) cm^{-1}, TLC : single spot.

Method II

Tribromo acid was obtained by treating aleuritic acid with 15% HBr in acetic acid for 8h on steam bath. It was debrominated by refluxing with $Na_2S_2O_3$ in dimethyl sulphoxide for 8h. ω-Bromo-Δ^9-hexadecenoic acid so obtained was refluxed with anhy. K_2CO_3 in DMSO for 8h to yield *trans*-isoambrettolide. IR: 1727.8(macrocyclic lactone), 969.02 (*trans* HC=CH) cm^{-1}. The product compared well with the authentic sample of *trans*-isoambrettolide (Co-TLC).

Synthesis of exaltone

9,10-Dihydroxy hexadecane-1,16-dioic acid (m.p., 123-25°C; yield, 80%) was prepared from aleuritic acid (m.p. 99-100°C; 12g) by acetonation followed by oxidation with $KMnO_4$. The product was converted into the corresponding unsaturated dioic acid (yield 55%) by

treatment with ethyl orthoformate/ benzoic acid followed by aq.alcoholic alkaline hydrolysis.

Dimethyl-*trans*-9-hexadecene-1,16-dioate was obtained from the above unsaturated dioic acid by refluxing it with dry MeOH containing catalytic amount of conc. H_2SO_4. The product was subjected to Dieckmann reaction to yield solid cyclopentadecenone, which formed 2,4-D.N.P. derivative (m.p. 171-73°C). TLC studies revealed the compound to be pure. Identification of the compound is in progress.

Synthesis of plant growth regulator (PGR)

Preparation of methyl 9-oxononanoate: Aleuritic acid was prepared from lac in quantity and crystallised with ethylacetate and water respectively. Azelaic acid aldehyde was prepared from aleuritic acid by following two methods:

Method A : Aleuritic acid (10g) was subjected to periodate oxidation using KIO_4 and H_2SO_4. The crude acid aldehyde (5g) obtained as a thick liquid, was esterified with ethereal solution of diazomethane. Crude methyl-9-oxononanoate was purified by column chromatography using petroleum ether and ethyl acetate as eluent.

Method B : Aleuritic acid (12g) was treated with KOH to obtain potassium salt, which was oxidised with KIO_4. The azelaic acid-aldehyde obtained in an yield of 50% was esterified with ethereal solution of diazomethane. In order to get methylester of azelaic acid aldehyde directly, aleuritic acid was esterified with MeOH using BF_3. Et_2O as catalyst. The ester was acetonated with acetone/conc. H_2SO_4 and oxidised with $KMnO_4$ to obtain methyl 16-carboxy-9, 10-isopropylidene dioxy pentadecanoate.

Methyl 9-oxononanoate, prepared above was condensed with malonic acid in the presence of dimethylaniline for 5 days at room temperature and refluxed on steam-bath for 3h. The product was analysed by TLC.

3.3 Modification of shellac/constituents and their utilisation

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

N. Prasad, K.M. Prasad, P.C. Sarkar and S.C. Agarwal

The project was taken up with an aim to improve the method of recovery of lac dye as its Ca-salt as well as in pure form from lac factory waste effluents and also standardise the currently used process of manufacturing aleuritic acid.

Lac dye

Calcium salt of lac dye was prepared following the methods of Kamath & Potnis (1952) and Ghosh & Sengupta (1977) developed earlier. By a slight modification of the above methods, selective precipitation of Ca-salt of lac dye in the acidic range was achieved. In the modified method, sticklac wash water was acidified with 10% acid and then Ca-salt of lac dye was precipitated by suitably adjusting the pH of the solution. This method opens up the possibility of segregating other dissolved materials from lac dye thus resulting in a purer product. Dyeing trials with the calcium

salt of lac dye thus prepared were carried out on wool and the results were satisfactory. Three samples of Ca-salt of lac dye prepared as above have been sent to M/s National Handloom Development Corporation, Lucknow for evaluation. A method based on spectrophotometric absorption measurements was evolved for the estimation of dye content in lac dye samples. The method is being standardised.

Aleuritic acid

Studies were made to optimise conditions for i) removal of wax and ii) period of hydrolysis of seed lac for better filtration rate and time in the aleuritic acid isolation method. Aleuritic acid was prepared from seed lac (fresh as well as old) following the method reported by previous workers, which involves dissolution of seedlac in 10% sodium carbonate solution followed by hydrolysis with caustic soda solution for separation of sodium aleuritate. It was observed that the yield of sodium aleuritate and aleuritic acid (crude) was 25% and 18% respectively on the wt. of seedlac. The low yield of sodium aleuritate is probably due to high dilution due to addition of sodium carbonate solution as sodium aleuritate is soluble in water. Following another method, seedlac was hydrolysed directly with caustic soda solution and the precipitated sodium aleuritate (35% yield) along with wax and other impurities was filtered and dried after usual washings with common salt solution. The precipitate was dissolved in boiling water and cooled, leaving wax and other impurities as insolubles which were quickly removed. The sodium aleuritate solution was treated with H_2SO_4 under controlled temperature and crude aleuritic acid was obtained at an yield of 25% which is an improvement over the previous method. Progressive hydrolysis of seedlac with caustic soda solution for separation of sodium aleuritate adopting usual procedure, was carried out. It was observed that the yield of aleuritic acid improves with the period of hydrolysis, reaching an optimum value of nearly 25% in 10 days.

3.4 Use of shellac and modified shellac in surface coatings

3.4.7 Modification of bi-product obtained during preparation of aleuritic acid for its use in surface coating

A. K. Dasgupta

Complete separation of the gummy mass could be achieved when the acidified mother liquor obtained during preparation of aleuritic acid was kept at room temperature for 10 days. Prior to this, sodium chloride, present in the mother liquor was separated.

Polymerisation experiments carried out with the gummy mass (obtained from the bi-product) revealed that when the gummy mass was heated at 170-175°C for 16.5h, it became completely infusible and insoluble. The gummy mass when heated at 170-175°C for 12h, polymerised partially and the product was found partly soluble in denatured spirit. Films prepared from the varnish of this product remained tacky even after air-drying for more than a month.

3.5 Use of lac for encapsulation and controlled release

3.5.6 Slow-release lac-based pesticidal systems

B.C. Srivastava and A.K. Jaiswal

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

Lac sticky trap: It was reported last year (Ann. Rep. 1993-94) that the adhesive layer of the system was modified with a plasticiser and bioassayed.

To bring further improvement in the adhesive layer, the waste gummy hydrolysed mass was modified with castor oil and dibutyl phthalate (DBP) in the ratio of 2:1:1 at 150±5°C as well as with castor oil alone in ratio of 13:3, in the presence of lime. The DBP-castor oil modified product showed improvment in stickiness.

Gummy hydrolysed mass modified with castor oil and DBP, as described above, was tried in 'sticky trap' for cockroach. No trapping of cockroaches was observed.

Slow-release lac-based 'monolithic' pesticidal composition

Preparation and bioassay of lac-based monolithic composition were reported last year (*Ann. Rep. 1993-94*). Larger lots were prepared without any difficulty for further bioassay of the material.

Studies on the effectiveness of the system, on ageing, were continued. After one-and-half year of ageing, the contact treatment resulted in the mortality of cockroach two days after the start of experiment and 50% of the test insects died within 3 days.

3.6 Electrical properties of lac and modified lac

3.6.5 Development of lac-based insulating material/varnish having imporved electrical properties

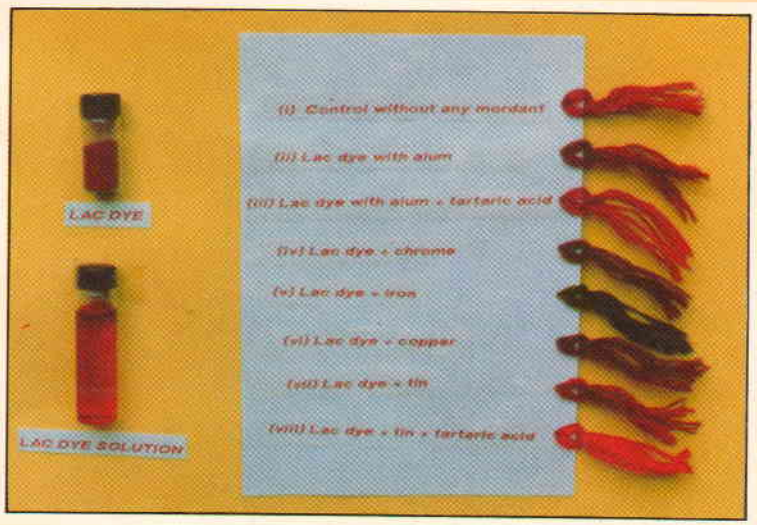
D.N.Goswami and P.M. Patil

Further studies were carried out on the electrical properties of blends of solutions of shellac and B-72 type polyvinylacetal (PVA) resin. Dielectric strengths of air-dried films of 50:50 and 60:40 blends of the above resins were found to be 70 and 72 kV/mm, respectively and after conditioning at 100% R.H. for 24h, 13 and 16 kV/mm, respectively. Dielectric strength of PVA film conditioned at 100% R.H. for 24h was reported (*Ann. Rep. 1993-94*) to be very low (6-8 kV/mm). Thus, incorporation of shellac in PVA solution increased its resistance towards humidity. Tracking resistance of the 60:40 blend was found 264V. Air-dried films of blends of solutions of 70:30, 50:50, 60:40 and 40:60 shellac - PVA passed the test for resistance to transformer oil at 120°C.

Variation of capacitance with temperature, of air-dried films of 40:60 and 60:40 blends of the above two resins was studied at 100 kHz. The above profiles of the blends were different from that of shellac, showing no decrease in capacitance above 80°C. This suggests compatibility of the two resins.

Dielectric studies were also carried out with B 60 type polyvinylacetal resin.

Healthy *kusmi* lac encrustation on *Flemingia semialata*, a bushy lac host (project 2.2.7)



Woollen threads dyed with calcium salt of lac dye, with and without mordants (project 3.3.14)

Dielectric strength of the polymer was 60 kV/mm and air-dried films of 60:40, 70:30, 50:50 and 40:60 shellac-PVA blends were in the range 61-68 kV/mm (shellac: 40 kV/mm). The films of 70:30, 50:50 and 60:40 blends also passed the resistance to transformer oil test. The tracking resistance of PVA (B-60) was found 250V and 70:30 shellac-PVA blend was 270V, indicating that the blend of shellac with PVA provides increased resistance to degradation. Dielectric properties of shellac-PVA blends were found to be better than those of shellac.

The melting profiles of shellac, PVA (B 60) and of 70:30 and 50:50 blends of the two were studied employing a Differential Scanning Calorimeter. The melting profiles of the blends were found to be different than of either of the resins, indicating their compatibility.

Dielectric strength of films of polyvinylacetate (PVAc) conditioned over 100% RH for 24h was reported earlier to be low (*Ann. Rep. 1993-94*). Dielectric strength values of air-dried films of 10:90, 30:70, 40:60, 70:30 and 80:20 blends of solutions of shellac and PVAc, conditioned over 100% R.H. were found to be 11,12,15,20 and 23 kV/mm respectively, indicating that shellac imparts humidity resistance to the polymer.

Ad hoc study

Study on the melting behaviour of *threo*-aleuritic acid and its derivatives by Differential Scanning Calorimeter

D. N. Goswami, R.N. Majee, S.K. Saha and S.C. Agarwal

The melting profiles of *threo*-aleuritic acid (9,10,16-trihydroxy palmitic acid), *erythro* - aleuritic acid and 16-hydroxy-*trans*- hexadec-9-enoic acid were studied employing a PERKIN ELMER (Model DSC 7) Differential Scanning Calorimeter. The results have been given in the **Table 15**.

Crude threo-*aleuritic acid*

Bleached aleuritic acid gave two sharp maxima at 85.24 and 89.82°C respectively. The unbleached aleuritic acid gave a main sharp maximum at 90.63°C and small peak around 76°C. The profile for unbleached acid indicates its purer nature. The analysis by Van't Hoff plot also revealed that purity of the unbleached form was more than that of bleached form. The onset temperature of unbleached aleuritic acid was higher (84°C) compared to that of the bleached form (81.9°C) confirming its higher purity.

threo-*Aleuritic acid crystallised with boiling water*

This gave melting peak at 99.89°C with a small shoulder at 99.1°C, the onset being at 94.66°C. The shoulder might have resulted due to a small crystal population developed during crystallisation. This material on further crystallisation gave a clear and sharp melting peak. The onset temperature of the recrystallised form was marginally higher (94.9°C). An inspection of the melting profiles of the two forms suggests higher crystallinity of the latter, the purity observed corroborated with the results (Table 15).

Table 15 Characteristics of *threo* - aleuritic acid and its derivatives

Forms of aleuritic acid	Onset(melting) temp (°C) determined by		Tm by Van't Hoff plot (°C)	Theoretical value (To) of Tm by Van't Hoff plot (°C)	Peak (°C)	Purity (%)	Heat of fusion (kJ/mole)
	D.S.C. melting profile	Conventional method (capillary)					
threo (crude, unbleached)	84.05	95-97	91.25	97.53	90.63	88.74	26.48
threo (crude, bleached)	81.9	-	87.28	91.58	89.82	86.19	35.48
threo (pure, from water)	94.66	-	93.69	93.67	99.89	100.14	65.04
threo (recrystallised, from water)	94.9	100-101	93.26	93.2	97.7	100.15	30.5
erythro (semipure)	110.75	-	115.7	118.11	117.13	95.58	23.43
erythro (pure)	118.53	123-124	119.31	121.24	123.24	87.14	86.32
threo (semipure, from ethyl acetate)	84.5	-	90.34	96.04	93.63	68.74	62.17
threo (recrystallised from ethyl acetate)	86.69	97-99	92.27	96.75	92.74	89.16	27.54
derivative (16-Hydroxy-*trans*-hexadec-9-enoic acid)	58.78	68-69	61.56	62.49	62.81	98.53	14.83

threo-*Aleuritic acid crystallised with ethyl acetate*

Two prominent peaks were observed at 80.7 and 93.63°C and a shoulder was noticed around 65.72°C. Onset was at 84.5°C. Recrystallised acid showed a sharp peak at 92.74°C. Three small endotherms were, however, noticed around 57.4, 65.4 and 75.2°C respectively, which might have resulted due to the melting of small crystal population formed during crystallisation. The purity of the recrystallised form was higher compared to that of semicrystallised form.

erythro - *Aleuritic acid*

The semipure acid gave a peak at 117.13°C with a small peak around 92.2°C, the onset was observed at 110.75°C. Recrystallisation exhibited absence of the small peak and the peak at 117.13°C shifted towards higher temperature (123.24°C). Onset also showed a higher value (118.33°C). Purity obtained however, was low, which is very difficult to explain. There was close resemblance in the observed (Tm) and the theoretical (To) values of melting temperature (Table 15) as deduced from the Van't Hoff plot.

16-Hydroxy-trans-*hexadec-9-enoic acid*

Creation of unsaturation at 9,10 position of aleuritic acid caused a marked change in the melting profile. A sharp peak at 62.81°C was observed indicating high degree of crystallinity and purity. Onset temperature was at 58.78°C. Small difference in Tm and To (Table 15) values also indicate high crystallinity.

Higher values of melting temperature by the conventional method observed in all cases (Table 15) can be explained by the following facts (i) very small quantity (a few particles) of material is taken, (ii) higher rate of heating, (iii) melting is realised only when a substantial quantity of the material changes its phase and (iv) human error. The inner change (Tg) of the material cannot be identified visually.

Conclusion

Crystallisation from boiling water gives the purest form of *threo*-aleuritic acid. Study of the melting of different forms of aleuritic acid suggests that the endotherms are very helpful in characterising the compound. The melting profiles depict a clear picture of presence of any impurity in the material, suggesting the need of its further purification for its ultimate utilisation in the synthesis of further useful compounds.

SECTION OF TECHNOLOGY

Researches in progress

4.1 Improvment in processing techniques

4.1.10 Improvement in storage life of lac at various stages

R. Singh and P. C. Gupta

Sticklac, seedlac and shellac deteriorate in quality, on storage. Lac looses its solubility in alcohol, gradually becomes insoluble after a few years and is unacceptable to the user. This deterioration depends on several factors, such as method of storage, humidity, temperature etc. The project has been initiated with an aim to increase the storage life of lac at room temperature by incorporating retarders, such as sodium acetate, triethanolamine, stearic acid, acetic acid. In addition, effect of inert atmoshphere (nitrogen), antiphotosensitive agents and higher pressure technology will also be studied.

During the year, *kusmi* sticklac of known origin was procured and converted into seedlac (after 3 months) by the conventional method. Sodium acetate and triethanolamine were uniformly mixed with seedlac, separately, in the proportion of 0.05, 0.10, 0.20 and 0.40 per cent on the weight of seedlac, applying tumbling technique. The same seedlac without treatment was taken as control. These were further converted into shellac by *bhatta* process (after 2 months) and stored in cloth bag. Cold alcohol solubility of these samples was determined at the interval of three months. The data are presented in **Table 16**.

Table 16 Cold alcohol solubility of shellac with and without retarders

Retarder	Age of samples (months)	Solubility (%) Percentage of retarders (w/w) 0	0.05	0.10	0.20	0.40
Sodium acetate	3	95.1	94.9	95.4	95.1	95.1
	6	94.2	93.1	94.0	93.7	94.5
Triethanol amine	3	95.1	94.9	94.5	94.2	95.2
	6	94.2	94.8	94.8	94.4	94.5

It was observed that solubility of shellac remained same in the case of sodium acetate. In case of triethanolamine, however, the solubility appears to be slightly higher than the control, after six months.

4.4 Pilot-plant studies of lac-based products and processes

4.4.4 Pilot-plant studies on manufacture of aleuritic acid and lac dye

P.C. Gupta, A. Pandey, R. K. Banerjee and R. Singh

Aleuritic acid

Aleuritic acid is one of the major constituent acids of shellac and is believed to be present to the tune of about 35-40 per cent. This acid is a raw material for the production of perfumery and other fine chemicals and is in much demand in the foreign market.

During the period, several lots of crude aleuritic acid were prepared taking one kg of *kusmi* seedlac in each lot following the latest method developed at ILRI. The yield was found 20-22% on the weight of seedlac. The melting point was 88-90°C and on crystallisation it was 95°C.

Bleached aleuritic acid was also prepared using sodium hypochlorite before hydrolysis of lac, in order to replace costly activated charcoal during crystallisation. The work was repeated with one kg lot, but the yield was found to be about 5% . Because of low yield, sodium aleuritate was prepared following the first method which was then bleached with sodium hypochlorite solution. It was found that the sodium hypochlorite used was 20 per cent of the volume needed, when used before hydrolysis. The aleuritic acid so obtained was snow white in colour and the yield was 20-22% as obtained in the first method mentioned above.

It was noticed that filtration of sodium hydrolysate of seedlac at reduced pressure took 3.5 hours, whereas when calcium carbonate was used as filter aid, it took only two hours. Thus an improvement to a great extent in the economy of the process was achieved.

A study was made on the recovery of aleuritic acid with various periods of hydrolysis ranging from 6 to 10 days. Maximum yield of aleuritic acid was obtained with ten-day hydrolysis. This is in agreement with the earlier reports that the period for complete hydrolysis is ten days.

Lac dye

Lac dye (laccaic acid) is a non-toxic and non-carcinogenic natural material and is used abroad for colouring edible food items, soft drinks, etc. In addition, crude dye can also be used for dyeing of wool and silk and, therefore, there is great interest on this dye within the country and abroad.

As already reported last year, the dye obtainable in sticklac diminishes on storage. The total dye content (from sludge and mother liquor) was found around 0.3% on the weight of sticklac. Preparation of calcium salt of lac dye was carried out on large scale at BISCOLAMF, Sidrol, Ranchi. About 1200 litres of sticklac wash water, without treatment of any washing aid, was collected in a tank. It was treated with 10% sulphuric acid till pH 3-3.5 was reached and left for overnight. The upper portion of mother liquor was transferred to a second cemented tank. To this, calcium carbonate was added till pH 7 was reached and left for overnight. Filtration of sludge and calcium salt of dye was carried out through drill cloth separately, but in both the cases filtration rate slowed down after some time due to choking of the pores of the cloth. A portion of Ca-salt of dye was filtered using Whatman filter paper under vacuum. On drying Ca-salt was found contaminated with impurities.

Attempts were also made to use flocculents, such as alum, polyacrylamide etc. without desired results. Thus, it was not possible to collect the total dye from

the sludge as well as mother liquor in one step.

Therefore, preparation of pure dye was carried out by treating the wash water with sulphuric acid and filtering the mother liquor under vacuum. The filtrate was converted into Ca-salt and then into sodium salt and passed through cation-exchange resin and distilled at reduced pressure. The yield was on an average 0.17% (on the weight of sticklac); the dye was light mahogany in colour and readily soluble in water. About 1 kg calcium salt of dye, as described above, was prepared to convert it into pure dye.

Crude dye for dyeing silk and wool: About 2 kg crude Ca-salt of dye was supplied to the Chemistry Division for further processing and forwardal to National Handloom Development Corporation, Lucknow. About 1 kg crude dye, containing 30% dye, was also supplied for onward transmission for trial at NHDC, Lucknow.

DIVISION OF EXTENSION

Research in progress

5.7 Studies on mechanism of degradation of lac on ageing

S. K. Saha

The project was taken up to study the mechanism of self-polymerisation of lac during storage in order to develop suitable technology to prolong the storage life of lac.

Freshly prepared shellac of standard quality, free from rosin and other additives, was used for the storage experiments. Shellac was powdered, mixed well by the usual method of halving and quartering and divided into several parts. One part was stored in a petridish under ambient light conditions, which served as the control. Another part was exposed to condensed u.v. radiation from a high pressure mercury lamp, daily, for 6h. For studying the action of antioxidants, six antioxidants of phenolic and amine types were used. Requisite quantities of shellac powder and different antioxidants were taken in a vessel separately and blended by melt-mixing under identical conditions. The blends were powdered and kept in a petridish under ambient conditions. Samples were drawn from each part at intervals of three months and tested for flow, heat polymerisation time (HPT) and hot alcohol insolubles. The results showed that the deterioration in respect of the above parameters was faster in the u.v. exposed sample than in the control. Slower rate of decrease in flow and HPT was observed in some of the antioxidants treated shellac samples. The work is in progress.

SUMMARY

DIVISION OF ENTOMOLOGY

Researches in progress

1.1.9 Separate management practices for broodlac and sticklac production, using *kusmi* lac insect, on *kusum* (*Schleichera oleosa*) have been evolved.

Broodlac production : A four-coupe system with 20g broodlac per pruned point; combination spray of endosulfan (0.05%) and BHC (0.05%) on one-month-old crop and again in November or June for the *aghani* and *jethwi* crops respectively.

Sticklac production : A two-coupe system with 20g broodlac per pruned point; inoculation on one-year-old shoots during June-July, partial harvesting on the maturity of crop and complete harvesting in subsequent June-July; combined spray of endosulfan and BHC on one-month-old crop in each crop season.

1.1.10 Studies conducted on *akashmani* (*Acacia auriculaeformis*) for lac cultivation showed that i) a brood lac rate of 10-20g/metre shoot length was optimum (*katki* 1994 & *aghani* 1994-95); ii)18-month-old shoots were the most suitable for crop inoculation and iii) use of broodlac from *akashmani* resulted in higher yield on the conventional host, *palas* and *kusum*.

1.1.12 A positive correlation was found between the number of pruned points and the total inoculable area, in *ber* (*Zizyphus mauritiana*) after light pruning. Heavy pruning, practiced by the villagers resulted in higher total inoculable area as compared to light pruning.

1.4.20 The insecticides cypermethrin (Bilcyp 10 EC) and fenvalerate (fenval 20 E.C.) were found safe from 0.00025 to 0.002% concentrations to second instar lac insects of *aghani* 1994-95 crop. The insecticides also had ovicidal effects on the eggs of the lac predators, *Eublemma amabilis* and *Pseudohypatopa pulverea*, when dipped or made to lay on treated surfaces. Treatment of broodlac with the above insecticides did not affect the settlement and coverage of lac insects.

Significant reduction in the pest infestation was observed due to repellent action of asafoetida and formaldehyde, without any adverse effect on lac insect.

The fauna associated with lac insect, during the *aghani* 1994-95 was studied.

The life period of *P. pulverea* reared on artificial diet varied depending on the diet and season.

1.5.8 The germplasm stock originating

from Taimara showed superior life and flow of 50 min and 70 mm respectively. A pure line of the cream mutant of the *rangeeni* lac insect was established. Study of the segregating progenies of the cross between crimson female and cream male confirmed that the *cream* gene was recessive to the wild allele. Wide variation was found in the lac productivity of individual female insects in the wild stock and an inbred line of *rangeeni* insect during the *katki* season. The mean and variance were not significantly different among the lines.

Ad hoc study

- A new variety of *kusmi* lac insect having 158 days *aghani* cycle and 200 days *jethwi* cycle as against the normal 210 days *aghani* and 160 days *jethwi* cycle, has been evolved after six generations of mass selection.

SECTION OF PLANT SCIENCES

Research completed

2.2.6 The estimates of heritability (in broad sense) of various growth attributes of *bhalia* revealed high values for the no. of primary branches and total shoot length per plant. These characters can, thus, be used for genetic improvement of this host through selection.

Researches in progress

2.1.11 Study of growth attributes of different lac hosts raised under experiment, revealed maximum plant height and girth in *galwang*. The *jethwi* 1994 lac crop was successfully raised with 600-800g sticklac yield per plant. During harvesting/ pruning, maximum biomass (dry weight) of twigs and leaves were obtained from *akashmani*.

Study on the effect of height of coppicing and fertilizer application on *kusrunt* showed better response with coppicing at 15 cm above ground level; maximum plant height was observed with application of 40 kg P_2O_5/ha and maximum plant girth with 40 kg N + 40 kg P_2O_5 /ha.

2.1.13 Work was taken up, to determine optimum plant density, height of coppicing and nutritutional requirement of *akashmani*. In the first phase, seedlings of the host were raised and transplanted during the monsoon.

2.2.7 The growth attributes of different species of *Flemingia* and the performance of lac crop raised on them were compared. The *aghani* 1994-95 was sucessfully raised on *F. semialata* with 270-400g broodlac and 90-210g sticklac yields per bush.

DIVISION OF CHEMISTRY

Researches in progress

3.2.15 Isoambrettolide was prepared from aleuritic acid using two methods.

Methyl 9-oxononanoate was prepared, in quantity, by two methods, from aleuritic acid in order to synthesise the candidate compound (PGR).

3.3.14 Calcium salt of lac dye was prepared by adopting different methods. These samples were tested for dyeing of wool with satisfactory results. A modified method was developed for preparing calcium salt of lac dye. Further, a method based on spectrophotometric absorption measurements for the estimation of dye content in lac dye samples, is being standardised.

Aleuritic acid was isolated from seedlac by alkaline hydrolysis followed by removal of wax and other insolubles from precipitated sodium aleuritate before decomposition by an acid. An improvement in the yield of aleuritic acid was obtained as compared to the existing method. Further, it was observed that the yield of aleuritic acid, improved with the period of hydrolysis upto ten days.

3.4.7 The heat polymerisation experiment with gummy mass showed that it becomes infusible and insoluble after heating at 170-175°C for 16.5h. It was further found that solution of partially polymerised gummy mass in denatured spirit can not be used as air-drying type varnish. Sodium chloride was separated from the mother liquor obtained during isolation of aleuritic acid.

3.5.6 The lac-based monolithic composition, tested after one-and-a-half year of ageing, resulted in 50% mortality of cockroaches in three days.

3.6.5 Dielectric properties of blends of shellac with two types (B72 and B60) of polyvinylacetal (PVA) resin were studied. Dielectric strengths of blends were higher than that of shellac. The blends showed resistance to transformer oil and tracking. It was observed that presence of shellac in PVA (B72) and PVAc improve their resistance to humidity. Shellac and polyvinylacetal resins were found to be compatible.

Ad hoc study

- The melting behaviour of *threo*-aleuritic acid and its derivatives has been investigated employing a Differential Scanning Calorimeter, providing information about the onset temperature, presence of impurity, crystallinity, heterogeniety etc.

SECTION OF TECHNOLOGY

Researches in progress

4.1.10 For improvement in the storage life of shellac two retarders, viz. sodium acetate and triethanolamine were tried separately. In the case of triethanolamine cold alcohol solubility of shellac was found to be slightly better than control after six months.

4.4.4 In order to carry out pilot plant studies on the manufacture of aleuritic acid, the latest method developed at the Institute was repeated several times and found to be reproducible. Calcium carbonate, when used as a filter aid during filtration of sodium hydrolysate of seedlac solution was found to reduce the time of filtration and therefore the process can be economised to a great extent.

Pure lac dye was prepared from mother liquor of treated wash water and the yield was found 0.17 per cent on the weight of sticklac. It was mahogany in colour and readily soluble in cold water.

Crude calcium salt of lac dye was also prepared for dyeing wool and silk fibres.

DIVISION OF EXTENSION

Research in progress

5.7 Shellac exposed to u.v. radiation was found to deteriorate at a faster rate than that kept under normal conditions. Some antioxidants were found to be effective in delaying the degradation.

PUBLICATIONS

Research papers

Goswami, D. N. and Kumar, S. (1995) Dielectric properties of shellac-polyvinylacetate resin blends, *Res. Indus.*, **40**, 18

Jaiswal, A.K. and Saha, S.K. (1995) Estimation of the population of parasitoids associated with lac insect *Kerria lacca* Kerr. on the basis of biometrical characters, *J. ent. Res.*, **19**, 27

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Srivastava, S.C., Kumar, P. and Mishra, Y.D. (1994) Air-layering in *galwang* (*Albizzia lucida* Benth) a lac host plant, *Indian Forester*, **120** (6), 524.

Papers presented in Seminar, Symposium etc.

Agarwal, S.C. (1994) Role of ILRI in the development of lac industry, in the Workshop-cum-Exhibition on Prospects of Lac Industry in Purulia District organised by Directorate of Cottage and Small Scale Industries, Govt. of West Bengal, at Purulia on 12.4.1994.

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Bhattacharya, A., Chaudhary, S.G., Mishra, Y.D. and Naqvi, A.H. (1995) Pests of lac and their management, in Proceedings of National Symposium on Emerging Trends in Pest Management, held on 28-30 June, Solan, Abstract No. 253, p. 132.

Jaiswal, A.K. and Saha, S.K. (1994) "*Bharatiya Lakh Anusandhan Sansthan ke kuchh vikas karyakram*" (in Hindi) presented at the 14th Ex-trainees Sammelan of Divyayan K.V.K., Ranchi.

Saha, S.K. and Goswami, D.N. (1994) "*Lakkha shilpe paribesh dushan, samasya o samadhan*" (in Bengali) presented in the Workshop-cum-Exhibition on 'Prospects of Lac Industry in Purulia District', organised by Directorate of Cottage and Small Scale Industries, Govt. of West Bengal, at Purulia on 12.4.1994.

Pamphlets, booklets etc.

- *Lakh ke utpadan mein shatru kito ka mahatva evam unki roktham* - a booklet in Hindi
- Lac - a folder
- *Lakh* - a folder in Hindi
- *Lakh udyog ke vikas mein Bharatiya Lakh Anusandhan Sansthan ki Bhumika* - a booklet in Hindi
- Anti-tracking air-drying type shellac-based insulating varnish - a folder
- ILRI training prospectus - a folder

EXTENSION ACTIVITIES

Training

Training programmes in lac sector were continued for trainers and supervisory-level personnel. Special focus was given to training of grass root level lac farmers through sponsored programmes. Training facility was also extended to household and tiny sector units employing women. Various training programmes organised during the year are summarised in the **Table 17.**

Lecture-demonstration-cum-visit was organised for 748 farmer trainees in 18 batches from Divyayan, K.V.K., Ranchi, 32 Forest Range Officers, in one batch and 56 students from various educational institutions.

Technical Advisory Service

Consultancy for direct service to the lac industry was provided through correspondence and personal contacts. The nature of support included supply of project/knowhow reports. All querries pertaining to lac and lac products, processing of seedlac/shellac, industrial uses of lac dye, gasket shellac compound, bulb capping cement, dry mounting tissue paper, aleuritic acid, dewaxed and decolourised lac, spiritless shellac varnish, sealing wax, paper varnish, lac-CNSL resin, French polish, major and minor hosts of lac, pharmaceutical and confectionary glazes etc. were attended.

Eighty-four lac crop samples received from lac growers and other organisations were examined for forecasting of crawler emergence and causes of lac insect mortality.

Testing

Facilities for testing lac and lac products were extended to the manufacturers, exporters and other organisations. During the period under report, 172 samples of lac and lac products were received and 415 tests were carried out for all the samples. These included ninety-two samples drawn from export consignments at the factory premises of the exporters. The Institute earned a revenue of **Rs 45,965** through these testings.

Publicity

The institute participated in the following exhibitions/farmers' fair.

i) Workshop-cum-exhibition on lac-based Industries held at Purulia on 12th April 1994 under the auspices of Directorate of Cottage and Small Scale Industries, Govt. of West Bengal.

ii) 17th Annual Central Kisan Mela of Divyayan Krishi Vigyan Kendra, Ram Krishna Mission Ashrama, Ranchi held at Getalsud on 9th and 19th Feb. '95.

Photographs and write-ups on selected themes were sent to ICAR for display at India International Trade Fair and Agri-Expo 1995.

Insect specimens, lac samples etc. were also sent to

i) Scientist I/c Raw Materials Herbarium and Museum, Publication and Information Directorate (C.S.I.R.), New Delhi.

Table 17 Details of training programmes conducted

Name of the course	No. of batches	Sponsoring organisation/beneficiary	Period	Total no. of persons trained
Three-month certificate course on 'Industrial Uses of Lac'	1	Private	Oct - Dec.'94	1
One- week course on 'Lac Cultivation Processing and Utilization'	6	Church Auxiliary for Social Action Tribal Development Project(CASA) Amrapad, Pakur	13-18 June'94	12
		Kendriya Paharia Gram Sabha, Littipada, Pakur	18-23 July'94	11
		Tribal Cooperative Marketing Development Federation of India Ltd.,(TRIFED), Ranchi.	1-6 Aug.'94	16
		-do-	8-13 Aug.'94	25
		Shanti Adivasi Kala Kendra, Ranchi.	16-21 Jan.'95	8
		-do-	20-15 Mar.'95	5
"On-Farm"training on Improved Methods of Lac Cultivation at Kamdara, Gumla Dist.	1	Bihar State Cooperative Lac Marketing Federation, Ranchi	1st Dec.'94	108
Entrepreneurs training programme "Method of preparation of Aleuritic acid"	2	M/s Atul Agencies Ranchi.	July-Aug.'94	1
		M/s Gupta Brothers (Shellac), Bundu, Ranchi.	Feb-March'95	1

Members of the Second Sub-committee of Parliament on Official Language holding discussions with the officials of the Institute regarding usage of Hindi.

Launching of the training programme on 'Improved Methods of Lac Cultivation' for the trainees sponsored by TRIFED

A batch of the trainees under the above programme

ii) Principal, APAU, Agriculture College, Amadalavalasa, Srikakulam (A.P.).

The following new publicity materials were compiled and designed during the period and D.T.P. prints were brought out.

i) *Lakh Ke Utpadan Mein Shatru Kiton Ka Mahatva Evam Unki Roktham* (Hindi - Booklet)

ii) *"Lakh"* (Folder - Hindi)

iii) *"Lakh Udyog Ke Vikas Mein Bhartiya Lakh Anusandhan Sansthan Ki Bhumika "* (Hindi Booklet).

iv) Anti-tracking air-drying type shellac based insulating varnish (Folder)

v) ILRI training prospectus (Folder)

Audio-visual publicity

Radio talk : In order to utilize the mass media for transfer of technologies developed at this institute, following radio-talks were recorded and broadcasted by All India Radio, Ranchi.

Topic	Date of Broadcast	Speaker
Ber , palas aur kusum par lah keet ka palan	23.7.94	Dr S.C. Agarwal
Adhik lakh utpadan ki nai takniken	10.09.94	Dr A.K. Jaiswal
Vyavasaik sujhaon-lakh udyog	26.10.94	Dr S.C. Agarwal
Lah keet ki suraksha prakritik apda se	06.11.94	Sri Lakhan Ram
Lakh keet palan ke adhunik tariken	27.11.94	Dr A.K. Jaiswal
Lakh utpadakon ke hit mein lakh udyogon ka vikas avashyak	14.01.95	Dr S.C. Agarwal
Palas evam kusum par lah keet palan ke kuchh avasyak batein	11.02.95	Dr A.K. Jaiswal

Documentary film : Necessary assistance was provided to an agency for the preparation of a video film on "Lac cultivation and its uses"

Museum

Institute Museum is well equipped with the exhibits, specimens, charts etc. providing clear vision of lac and its prospects. Six new panels consisting of 11 charts were added to the museum.

MISCELLANEA

SEMINARS, SYMPOSIA, MEETINGS ETC.

Attended by Dr S.C. Agarwal, Director

Directors' and Project Coordinators' Meeting under the Agricultural Engineering Division on Agricultural Research Priority needs held at Krishi Bhavan on 15.11.1994.

Meeting organised by Ranchi Development Corporation, Chhotanagpur Division for promoting lac industry in Bihar State on 16.5.1994.

Meeting of Shellac Export Promotion Council at Calcutta on 16.8.1994 (238th) and on 31.1.1995 (241st meeting)

Annual meeting of Sectional Committee CHD 023 on Lac and lac products as the Chairman organised by Bureau of Indian Standards at New Delhi on 27.5.1994.

Workshop on Natural Dyes organised by Department of Textile Engineering, Anna University, Madras on 27-29 January 1995. Presented a paper entitled "Lac dye and its significance"

Workshop-cum-Exhibition on Prospects of Lac Industry in Purulia District Advisory Committee on Lac, Govt. of West Bengal, at Purulia on 12.4.94. Presented a paper entitled "Role of ILRI in the development of lac industry" authored by S.C. Agarwal.

Training Course on Management of R & D Systems at ASCI, Hyderabad, 29 Aug.- 3 Sept. 1994.

Directors meeting of ICAR at New Delhi, Nov. 1994.

Attended by the Scientists

Dr S.K. Saha, Principal Scientist & Head of the Division of Chemistry & Extension, attended Workshop-cum-Exhibition on Prospects of Lac Industry in Purulia District organized by District Advisory Committee on Lac, Govt. of West Bengal at Purulia on 12.4.94. Presented a paper entitled *"Lakkha shilpe paribesh dushan, samasya o samadhan"* (in Bengali) authored by S.K. Saha and D.N. Goswami.

Shri R Ramani, Scientist (SG), Division of Entomology also attended the above workshop and the arranged the exhibition on various aspects of lac.

Dr A. Bhattacharya, Senior Scientist, Entomology Division, attended the National Symposium on Emerging Trends in Pest Management, organised by Indian Society of Pest Management and Economic Zoology in collaboration with Dr Y.S. Parmar University of Horticulture and Forestry, at Solan, Himachal Pradesh during 28-30 June, 1994. Presented a paper entitled "Pests of lac and their management" authored by A. Bhattacharya, S.G. Chaudhary, Y.D. Mishra and A.H. Naqvi.

A panoramic view of the exhibition put up by the Institute in the Workshop-cum-Exhibition on 'Prospects of Lac Industry in Purulia' organised by the Directorate of Cottage and Small-scale Industries, Govt. of West Bengal held at Purulia.

A section of the exhibition

Hon. Shri Prabir Sengupta, Minister of Small-scale Industries visiting Institute's exhibition.

TECHNICAL SERVICES

Library

Library continued to provide facilities for literature search and consultation services to the scientists of the institute as well as to a number of scholars, professors and research workers from other institutions viz.,BIT, Ranchi; Ranchi University, Ranchi; IIT, Kharagpur; NML, Jamshedpur; Patna University, Patna and Bihar University, Muzaffarpur.

Details of the library holdings are given below :

Documents	Additons during the period	Total
Books, bound volumes	835	21,647
Annual Reports	139	2,606
Reprints, photocopies etc.	12	239
Bulletins, Research notes etc.	-	501

A sum of Rs 8.5 lakhs was spent on the acquisition of periodicals and other forms of publications during the year.

Purchase of books and periodicals was made on the basis of the guidelines received from Good Offices Committee, New Delhi and ICAR. Most of the periodicals/books have been purchased directly from the publishers.

The library continued to maintain exchange of ILRI publications with many scientific libraries of the country and abroad.

Details of the library acquisions are:

Particulars	National	International
Number of journals subscribed	65	28
Number of journals acquired in exchange or gratis	69	21
Number of research institutes/ information centres with whom Institute library maintains exchange relationship	19	19

The Institute library continued as a contributing member of NUCSSI (National Union Catalogue of Scientific Serials in India), a project sponsored by INSDOC, New Delhi for National Holdings Network in science and technology in India.

The library continued to be an institutional member of British library service through I.C.C.R. (Indian Council for Cultural Relations) and utilizes their lending services for the benefit of scientists of the Institute.

A water cooler was installed in the library for the readers.

Technical and Monitoring Cell

The Cell continued to provide services for the research activities of the institute. The Cell convened meetings of the Staff Research Council for reviewing the progress of on going research projects, to examine the new research projects to be undertaken and also prepared the proceedings of the meetings for circulation. Besides, the Cell maintained research project files. Activity milestones of different research projects were also compiled for onward transmission to the

Council. Various reports, such as monthly report for the Cabinet, Quarterly report for the O.R.P., twenty-point programme, material for DARE report and Research Highlights of ICAR were also compiled. The Cell also processed the research papers for forwardal to scientific and popular journals.

Farm Unit

Management and general maintenance of the institute plantation area and the campus were continued. Hoeing, weeding, mulching and ploughing operations were carried out in different plots of lac hosts. The gaps in the plots of the various lac host species were filled with appropriate seedings. Necessary arrangments were made for irrigation and transportation related to research work and also for the security of the farm. Seedlings of lac host plants were raised for filling up vacant spaces in respective plots and utilisation in research experiments. Seedlings of *galwang* (100 no.), *bhalia* (200 no.) and *akashmani (1000 no.)* were planted in the vacant plots and also vacant spaces in the plots of the above hosts. Broodlac of *kusmi* and *rangeeni* strains were inoculated on *kusum, palas, ber* and *khair* plants in the model demonstration plot. Seasonal and other ornamental plants were planted for beautification and maintained near the buildings of the institute campus. Regular maintenance of roads, hedges of campus was also done. The total return from the Farm through the sale of different farm proudce, grass cutting charges, pruned twigs, firewood, foliage and ornamental plants etc. was Rs 4116.

Maintenance and Workshop

The workshop unit of the institute undertook the maintenance of water and electricity 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, 1046; plumbing, 386; welding, 120; carpentry, 220; instrument repairing, 310; servicing/repair of pump sets and other machines; 156.

Art and Photography

The art and photography unit provided services in support of research and extension activities. Pictures were taken of lac insects and associated insects, lac hosts and other research materials at the Institute and at Hesal Field Area. Pictures were also taken during the visit of VIP's, important activities, meetings and functions. Photographs depicting various aspects of lac as well as Institute's achievements and activities were taken for use in International Trade Fair and ICAR Annual Report. This included 354 colour photographs, and 78 colour transparency 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.
- Procurement of reference literature in Hindi.

Health Care

A part-time Authorised Medical Attendant visits the Institute's Dispensary to attend to the medical needs of the staff and their dependants, on the working days. He is supported by one Stockman-cum-Compounder, one Junior Clerk and an attendant. During the period, 3038 patients were attended to, 59 patients were referred to specialists at R.M.C.H., Ranchi.

Medical bills submitted by the staff members were also processed for reimbursement.

IMPORTANT COMMITTEE

Management Committee

The Management Committee assists the Director in monitoring the progress of research under various research programmes of the institute and suggests suitable modifications, new researches etc. It helps in solving the problems related to research and administration. The Committee also helps in formulating the proposals for Annual and Five Year Plans.

The members of the Committee were as follows :

Dr S. C. Agarwal — Chairman
Director
Indian Lac Research Institute
Namkum, Ranchi.

Dr R.P. Kachru — Member
Assistant Director General (P.E.)
Indian Council of Agricultural Research
Krishi Bhavan
New Delhi

The Director (Research) — Member
B.A.U. , Ranchi

The Conservator of Forests (Work Planning) — Member
Employment.Circle, Ranchi

Sri Suresh Chandra Mohanty,IFS — Member
Conservator of Forests
Development Circle, Cuttack, Orissa

Dr Ashok Kumar Singh — Member
AF C-5 Imlak Colony -II, Nadesar
Varanasi 221 002, U.P.

Sri Shamsher Singh Verka — Member
94 The Mall
Amritsar, Punjab

The Finance & Accounts Officer — Member
C.I.C.F.R.I.
Barrackpore 743 101
West Bengal

Dr P. Kumar — Member
Principal Scientist & Head, Section of
Plant Sciences
Indian Lac Research Institute
Namkum, Ranchi.

Sri R.C. Mishra — Member
Scientist(SG)
Indian Lac Research Institute
Namkum, Ranchi.

Dr B.P. Singh — Member
Senior Scientist
Indian Lac Research Institute
Namkum, Ranchi.

Dr A Pandey — Member
Senior Scientist
Indian Lac Research Institute
Namkum, Ranchi

The Administrative Officer — Member -Secretary
Indian Lac Research Institute
Namkum, Ranchi.

The 20th meeting of the Management Committee was held on 29th October 1994 at this Institute.

IMPORTANT MEETING

The Second Sub-committee of Parliament on Official Language, which included Honourable members of Parliament, Sri Jagdish Prasad Mathur, Sri Udai Pratap Singh and Sri Choudhary Harmohan Singh visited Ranchi during September 8-9, 1994 for inspection of implementation of Official Language Policy in six Central Government Offices of Ranchi. The Director, ILRI, Namkum was appointed the co-ordinator for organising the visit of the above inspection committee.

A meeting of the officials of ILRI was convened at the Institute on September 9th, 1994 to review the implementation of Official Language. The Institute gave certain assurances for promoting use of Hindi in the official work.

SPORTS

The Institute team, comprising of 39 participants, Dr B.P. Singh (Senior Scientist) as Chief-de-Mission and Sri B.N. Gope and Sri D.K.Singh as team managers, took part in the Zonal Inter-Institutional Tournament for Zone III for the year 1993 held at I.I.S.R., Lucknow during 5-9 April 1994.

In the team event, our Institute Badminton Team, comprising of Sri N.K. Dey, Dr. A. Bhattacharya, Shri D.W. Runda, Sri D.K. Singh and Sri P. Kumar secured the runner position. Sri N.K. Dey also won the runner-up title in the individual badminton championship event.

VISITORS

During the period under report, 1340 persons visited the museum from all walks of life including farmers, housewives, students, businessmen, servicemen, forest officers, trainees, journalists etc.

Some of the distinguished visitors were:

Col. R.K. Katyal, EME, H.Q. MPB C/0 Orissa Area, Jabalpur.

Dr N.L. Mungal, Professor, BIT, Mesra, Ranchi.

Smt. Mridula Sinha, Administrator, B.S.T.C.D.C., Ranchi.

Dr S.K. Majumdar, Zonal Manager, TRIFED, Calcutta.

Sri Gopal Singh, Dy Chief Manager, Bank of India, Calcutta (W.B.)

Sri K. Bhatia, Chief Engineer, Min. of Food & Industries, New Delhi.

Sri Atam Prakash, Company Secretary, Modern Food Industries India Ltd., New Delhi

Hon'ble Sri Udai Pratap Singh, M.P., New Delhi.

Hon'ble Sri Chaudhary Harmohan Singh, M.P., New Delhi.

Hon'ble Sri Jagdish Prasad Mathur, M.P., New Delhi.

Sri K. Kumar Grover, Secretary, Rajbhasha, ICAR, New Delhi.

Sri Rajendra Prasad Gupta, Director, Rajbhasha, ICAR, New Delhi.

Dr Deepti Sen, Reader, Dept. of Zoology, Jogamaya Devi College, Calcutta.

Major Ajai Yadav, O.C., H.Q. Coy. 15 JAK RIF C/o 99 APO

Col. S.C. Sahni, H.Q. M.P. B.40 Area Jabalpur, M.P.

Brig. N.S. Pathania, HQ, 301 Infantry Brigade C/o 56 APO.

Brig. S.S. Sidhu, HQ. 61 Infantary Brigade C/o 99 APO.

Sri Ramswarup, IPS, Dy Inspector General of Police, South Chhotanagpur Region, Ranchi.

Sri T. Nakada, Faculty of Agriculture, Kokkaido University, Sapporo, Japan.

Sri S. Banerjee, DAS EXPDR Observer, C/o CMPDI, Ranchi.

Dr R.P. Kachru, ADG (Process Engineering) ICAR, New Delhi.

Honourable Members of Parliament visiting the Institute Museum (L to R : Dr S.K. Saha (Head, Extn. Division), Hon. Shri Uday Pratap Singh, M.P., Dr S.C. Agarwal (Director) and Hon. Shri Choudhary Harmohan Singh, M.P.

A group of undergraduate students from West Bengal, at the Museum

Left and bottom : Dr R.P. Kachru, A.D.G. (PE), at the Institute plantation discussing with the Scientists, about research activities.

PERSONNEL

i) List of personnel as on 31.3.95

Director

Dr S. C. Agarwal

Division of Entomology

Head of Division
Sri A.H. Naqvi

Senior Scientist
Dr. S.K. Jaipuriar (Agric. Entomol.)
Dr. A. Bhattacharya "

Scientist (S.G.)
Sri R. Ramani (Agric. Entomol.)

Scientist (Sr. Scale)
Sri S. G. Choudhary (Agric. Entomol.)
Sri Y. D. Mishra "
Sri M.L. Bhagat "

Scientist
Sri K.K. Sharma "
Dr B. Subba Rayudu "

Technical Officer
Sri A.K. Sahay (T-5)
Sri R. N. Vaidya "

Field/Farm Technician
Sri M.L. Rabidas (T-II-3)
Sri R.D. Pathak (T-I-3)
Sri R.L. Ram (T-I-3)
Sri H.N. Shukla "
Sri K.P. Gupta (T-I-3)
Sri K.C. Jain "
Sri D.K. Singh "
Sri A.K. Sinha "
Sri D.W. Runda (T-2)
Sri Binod Kumar "
Sri P.A. Ansari (T-1)
Sri R.G. Singh "

Lab Technician
Sri Bhola Ram (T-II-3)
Sri G.M. Borkar (T-I-3)
Sri S.K. Chatterjee "
Sri G. Das "
Sri R.K. Swansi "

Jr Stenographer
Smt. S. Prasad

Regional Field Research Station, Dharamjaigarh

Field/Farm Technician
Sri R.S. Maliya (T-4)
Sri Jiwan Lal (T-I-3)

Lab Technician
Sri A. Hussain (T-I-3)

SECTION OF PLANT SCIENCES

Head of Section
Dr P. Kumar

Senior Scientist
Dr B.P. Singh (Agron.)

Scientist (S.G.)
Sri S.C. Srivastava (Plant Breeding)

Scientist
Sri S. Ghosal (Agron.)

Lab Technician
Sri D.D. Prasad (T-I-3)
Sri Mohan Singh (T-2)

Field/Farm Technician
Sri K.A. Nagruar (T-2)

DIVISION OF CHEMISTRY

Head of Division
Dr S.K. Saha (interim)

Senior Scientist
Dr D.N. Goswami (Physics)
Dr B.C. Srivastava (Org. Chem.)
Dr N. Prasad "
Dr R.N. Majee "
Dr K.M. Prasad "

Scientist (Sr. Scale)
Sri A.K. Dasgupta (Org.Chem.)
Sri P.M. Patil (Phys.Chem.)

Scientist
Sri I. Rajendran (Org. Chem.)
Sri P.C. Sarkar "
Sri V.K. Rao "

Technical Officer
Sri D.D. Singh (T-5)
Sri N.K. Dey "
Sri T.K. Saha "

Lab. Technician
Sri M. Ekka (T-4)
Sri U. Sahay (T-I-3)
Sri B.P. Keshry "
Sri P. B. Sen "
Smt. P. Devi (T-I-3)
Sri H. Das (T-1)

SECTION OF TECHNOLOGY

Head of Section
Dr P.C. Gupta

Senior Scientist
Dr A. Pandey (Phy.Chem.)

Scientist (Sr. Scale)
Sri R.K. Banerjee (Org. Chem.)
Sri Radha Singh (Phys. Chem.)

Technical Officer
Sri M. Islam (T-5)

Lab. Technician
Sri K.K. Prasad (T-4)
Sri N. Minz (T-I-3)
Sri M.K. Singh "
Sri T. Ram "

DIVISION OF EXTENSION

Head of Division
Dr S.K. Saha

Scientist (S.G.)
Sri R.C. Mishra (Agric.Entomol.)

Scientist (Sr Scale)
Sri J. Lal (Agric. Entomol.)
Dr A K Jaiswal "

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

Technical Officer
Sri B.P. Banerjee (T-5)
Sri R.C. Maurya "
Sri D. Ghosh "
Sri L.C.N. Sahdeo "
Sri K.M. Sinha "

Publicity Officer (Auxiliary)
Sri Lakhan Ram

Lab Technician
Sri J. Singh (T-4)
Sri B.P. Ghosh (T-I-3)
Sri J.K. Ambuj (T-2)

Field/Farm Technician
Sri H. Bhengra (T-4)
Sri S.S. Prasad (T-I-3)
Sri S.B. Azad (T-2)

Jr Artist-cum-Photographer
Sri R.P. Srivastava (T-I-3)

Museum Assistant
Smt. R. Sen (T-2)

Jr Stenographer
Sri A.K. Sinha

ADMINISTRATIVE AND AUDIT & ACCOUNTS SECTION

Admin. Officer
Vacant

Asst Admin. Officer
Sri H.S. Munda

Finance & Accounts Officer
Sri Pradeep Kumar

Superintendent
Sri Md. Samiullah
Sri N. Mahto

Sr Stenographer
Sri R. Ravidas

Assistant
Sri A.K. Chaudhuri
Sri A. Haque
Sri R.B. Singh
Sri K.D. Pandey
Sri K.N. Sinha
Sri B. Ram
Sri Ravi Shankar
Sri D. Ram

Sr Clerk
Sri S. Ram
Smt. S. Guha
Sri K.L. Chaudhuri
Sri R.K. Upadhyaya
Sri N. Topno
Sri V. Ram
Sri Md. Mubarak
Sri E. Gari
Sri T. Minz
Sri B.N. Gope
Sri A. Pandey
Sri B.K. Rajak

Jr Clerk
Sri N. Gope
Sri P. Singh
Sri S.C. Lal
Sri R.N. Mahto
Sri B. Sahu
Sri W. Guria
Sri K.P. Arya
Sri P. Kumar
Sri A.K. Tripathi
Sri R.K. Toppo
Sri A. Gope
Sri K.K. Deonath
Sri Samal Kumar

FARM UNIT

Farm Superintendent
Sri N.K. Sharma (T-6)

Field/Farm Technician
Md. A. Ansari (T-II-3)
Sri R.C. Singh (T-I-3)
Sri V.K. Tewari "

Tractor Driver
Sri M. Surin (T-I-3)

TECHNICAL AND MONITORING CELL

Sr Technical Officer
Sri S.K.M. Tripathi (T-8)

Technical Officer
Sri R. Prasad (T-5)

Lab.Technician
Sri D.Ganguli (T-4)

LIBRARY
Technical Officer
Sri R.P.Tewari (T-5)
Sri V.K. Singh "

MAINTENANCE AND WORKSHOP UNIT

Maintenance Engineer
Sri Hans Raj (T-6)

Technical Officer
Sri S.K.Srivastava (T-5)
Sri S.K. Bhaduri "

Instrument Mechanic
Sri H.L. Bhakta (T-2)

Glass Blower
Sri B.S. Chowdhary (T-1)

MEDICAL UNIT

Authorised Medical Attendant
Dr N. P. Sahu M.D.

Stockman-cum-Compounder
Sri C. Pandey (T-I-3)

HINDI CELL
Assistant Director (O.L.)
Sri Lakshmi Kant

Hindi Translator
(Auxiliary)

Dr Anjesh Kumar

TRANSPORT

Driver
Sri Bandhan Runda (T-2)
Sri J. Tewari (Aux.)
Sri N. Lakra -do-
Sri A. Kumar -do-

(ii) Promotions etc. during the period

Promotions

	Promoted to	w.e.f
Dr K. M. Prasad	Sr Scientist	1.1.1986
Dr S. K. Jaipuriar	"	1.1.1986
Dr A. Bhattacharya	"	1.7.1986
Sri S.C. Srivastava	Scientist (S.G.)	1.1.1986
Sri N.K. Dey	T-5	1.1.1990
Sri K.M. Sinha	"	1.1.1990
Sri T.K. Saha	"	1.7.1990
Sri R.N. Vaidya	"	1.1.1991
Sri V.K. Singh	"	1.1.1992
Sri S.K. Srivastava	"	1.7.1992
Sri S.K. Bhaduri	"	1.1.1993
Sri R.S. Maliya	T-4	1.1.1990
Sri V.K. Tiwari	T-1-3	1.1.1988
Sri K.C. Jain	"	1.1.1990
Smt. P. Devi	"	1.1.1991
Sri R.P. Srivastava	"	1.1.1991
Sri D.K. Singh	"	1.1.1993
Sri A.K. Sinha	"	1.1.1993
Sri R.K. Swansi	"	1.1.1993
Smt. Ratna Sen	T-2	1.1.1990
Sri S.B. Azad	"	1.7.1990
Sri J.K. Ambuj	"	1.7.1990
Sri D.W. Runda	"	1.7.1990

Appointments

	Appointed as	Date
Sri B.K. Rajak	Sr Clerk	18.5.1994
Sri Shamal Kumar	Jr Clerk	23.11.1994

Transfers

	Transferred to	Date
Sri S. Ghosal, Sc. from CRRI, Cuttack	I L R I	5.12.1994
Sri D.N. Ganguli from ICAR Head Quarters, New Delhi	I L R I	2.5.1994

	Transferred to	Date
Sri A.K. Lal, Supdt. on promotion to the post Asst.Finance Officer	CHES, Ranchi	30.1.1995 (A.N)

Retirements	Designation	w.e.f
Sri S. Kumar	Pr.Sc. & Head Div. of Chem.	31.5.1994
Dr A.K. Sen	Scientist(Sr Scale)	31.12.1994
Sri D.N. Mahto (on medical ground)	Sr Clerk	14.7.1994
Sri Shyam Lal Ram	Peon	31.7.1994

Deaths	Designation	Date
Sri A. Rahman	Technical Officer	16.6.1994
Sri Ropna Mahto	Beldar	4.5.1994
Sri Paulus Oraon	Beldar	8.5.1994

(iii) Category-wise breakup of number of employees and the number of Scheduled Castes and Scheduled Tribes amongst them as on 31.3.1995

Class of post	No. of posts sanctioned	No. of employees in position	No. of SC employees	No. of ST employees
Scientific				
R.M.P. Scientist	1	1	-	-
Principal Scientist Sr. Scientist/Scientist (SG) Scientist (Sr Scale) Scientist	55	32	2	-
	56	**33**	**2**	**-**
Technical				
Category III	4	3	-	-
Category II	36	25	2	2
Category I	47	40	4	6
	87	**68**	**6**	**8**
Administrative				
Admin. Officer	1	1	-	-
Fin..& Accounts Officer	1	1	-	-
Asst. Admin. Officer	1	1	-	1
Asst. Director (OL)	1	1	-	-
Superintendent	3	2	1	-
Sr Stenographer	1	1	1	-
Jr Stenographer	4	2	-	1
Assistant	8	8	1	1
Sr Clerk	13	12	1	3
Jr Clerk	16	14	1	3
	49	**43**	**5**	**9**
Supporting				
Grade IV	9	3	2	-
Grade III	18	17	3	9
Grade II	36	30	4	13
Grade I	72	45	5	22
	135	**95**	**14**	**44**
Auxiliary	**14**	**7**	**1**	**3**
Grand Total	**341**	**246**	**28**	**64**

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)
1994								
April	35.30	21.65	29.82	22.25	62.20	32.0	38.5	20.0
May	40.79	26.82	32.35	28.28	73.51	25.0	42.0	24.6
June	32.77	25.06	27.66	25.82	83.70	506.75	41.0	23.0
July	32.56	23.34	24.32	23.56	82.87	947.80	37.5	21.6
August	31.25	23.08	25.82	24.87	84.77	360.90	33.0	22.5
September	30.88	21.60	25.90	23.52	80.60	288.25	30.0	19.0
October	30.50	16.52	26.48	25.66	83.38	141.50	32.0	15.5
November	29.35	13.32	21.68	18.62	72.36	3.50	31.0	10.5
December	25.18	7.86	16.68	18.89	79.74	NIL	25.5	6.4
1995								
January	21.73	9.42	25.92	23.90	85.96	22.5	22.5	5.2
February	23.62	11.17	26.10	25.02	84.85	18.0	27.0	10.0
March	28.34	20.75	22.40	21.48	78.64	35.75	37.0	12.0

The highest maximum temperature	:	42°C on 5th May 1994
The lowest minimum temperature	:	5.2°C on 2nd January 1995
Total rainfall during the period	:	2381.95 mm
Monsoon rainfall (June-September)	:	2103.70 mm

Erratum

Annual Report 1993-94, page 28, column1, last para, line 6

Instead

.....The yield was 30% on the weight of sticklac.....

To be read

.....The yield was 3.0% on the weight of sticklac.....

वार्षिक प्रतिवेदन 1994-95

भारत में लाख उद्योग की स्थिति की जाँच एवं इसके बहुमुखी सुधार के लिए भारत सरकार द्वारा गठित जाँच समिति की अनुशंसा के फलस्वरुप भारतीय लाख अनुसंधान संस्थान की स्थापना की गई।उक्त समिति के सुझावों के कार्यान्वियन हेतु लाख उद्योग से जुड़े लोगों ने "इन्डियन लैक एसोसिएशन फॉर रिसर्च" नामक एक गैर सरकारी संस्था का गठन किया तथा इसे पंजीकृत कराया। इस एसोसिएशन ने 1925 में भारतीय लाख अनुसंधान संस्थान की स्थापना की। सन 1931 में भारत सरकार ने भारतीय लाख कर समिति का गठन किया जिसने इस संस्थान का अधिग्रहण कर लिया। 01 अप्रैल 1966 से भारतीय लाख कर समिति समाप्त कर दी गई तथा भारतीय लाख अनुसंधान संस्थान, भारतीय कृषि अनुसंधान परिषद के प्रशासनिक नियंत्रण में आ गया।

राँची शहर से नौ कि. मी. पूरब में राँची टाटा उच्च पथ पर स्थित यह संस्थान कुल 49 हे. क्षेत्र में फैला हुआ है जिसमें संस्थान के दो परिसर तथा 36.5 हे. क्षेत्र का एक बागान शामिल है। मुख्य परिसर में कीट विज्ञान विभाग, रसायन विभाग, पादप विज्ञान अनुभाग, प्रसार विभाग के प्रयोगशालाओं के अतिरिक्त प्रशासकीय, वित्त व लेखा, पुस्तकालय, तकनीकी कक्ष, यांत्रिकी अनुभाग एवं औषधालय और आवास गृह के भवन स्थित हैं। प्रौद्योगिकी परिसर में प्रौद्योगिकी अनुभाग की प्रयोगशाला, प्रशिक्षु छात्रावास तथा आवासीय भवन हैं। संस्थान के अन्तर्गत एक क्षेत्रीय लाख अनुसंधान केन्द्र भी कार्य कर रहा है जो मध्य प्रदेश के धर्मजयगढ़ में स्थित है। भारतीय लाख अनुसंधान संस्थान, लाख की खेती, परिष्करण एवं उपयोग संबंधी अनुसंधान में कार्यरत एक अग्रणी संस्था है। लाख की खेती अधिकांशतः बिहार एवं इसके निकटवर्ती राज्यों के 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 प्रविधियाँ 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 अनुसंधान कार्य के लिए भारतीय लाख अनुसंधान संस्थान अन्तरराष्ट्रीय ख्याति प्राप्त कर चुका है।

उद्देश्य

- लाख के उत्पादन, शुद्धिकरण एवं उपयोग के क्षेत्र में सुधार लाने हेतु अनुसंधान कार्य करना।
- लाख के उत्पादन एवं संसाधन के विकास प्रबन्धन हेतु क्षेत्र विशेष के लिए प्रौद्योगिकी के विकास को नेतृत्व प्रदान करना।
- राज्य सरकार एवं उद्योगों के सहयोग से लाख उत्पादन, संसाधन एवं उपयोग प्रौद्योगिकी के प्रशिक्षण के लिए केन्द्र के रुप में कार्य करना।
- लाख उत्पादन, संसाधन एवं उपयोग से संबंधित सूचनाओं के संग्रह का कार्य करना।
- उपरोक्त उद्देश्यों की प्राप्ति के लिए राष्ट्रीय एवं अन्तर्राष्ट्रीय एजेन्सियों के साथ सहयोग करना।

संगठनात्मक व्यवस्था

संस्थान के शीर्ष अधिकारी निदेशक होते हैं। अनुसंधान कार्य के लिए संस्थान में तीन विभाग– कीट विज्ञान विभाग, रसायन विभाग तथा प्रसार विभाग एवं दो अनुभाग– प्रौद्योगिकी अनुभाग तथा पादप विज्ञान अनुभाग हैं। प्रशासनिक खण्ड में निदेशक का कार्यालय, प्रशासकीय अनुभाग, क्रय अनुभाग, वित्त व लेखा अनुभाग एवं केन्द्रीय भण्डार हैं। सहायक इंकाईयों के अन्तर्गत हिन्दी प्रकोष्ठ, सुरक्षा, चिकित्सा और संपदा-अनुरक्षण सेवाएं हैं। तकनीकी सहयोग हेतु पुस्तकालय, फार्म ईकाई, अनुरक्षण एवं कर्मशाला तथा तकनीकी एवं मॉनिटरिंग ईकाई कार्यरत हैं।

स्टाफ

संस्थान में 56 वैज्ञानिक, 87 तकनीकी, 49 प्रशासकीय, 14 सहायक एवं 135 चतुर्थवर्गीय पद स्वीकृत हैं।

बजट

वर्ष-1994-95 की अवधि में गैरयोजना मद में वजट अनुमान रु. 140.00 लाख के विपरीत रु. 174.20 लाख खर्च हुआ जब कि योजना मद में बजट अनुमान रु. 53.00 लाख के विपरीत रु. 59.51 लाख खर्च हुआ।

लाख उत्पादन

संस्थान द्वारा हेसल में, कुसुम वृक्षों के एक प्रायोगिक क्षेत्र का रख-रखाव किया जाता है, जो मुख्य परिसर से 18 कि.मी. की दूरी पर स्थित है। रिपोर्ट की अवधि में 2565 कि. ग्रा. वीहन लाख का उत्पादन किया गया जिसमें से 2200 कि. ग्रा. (मूल्य रु. 2,05,940) का उपयोग विभिन्न प्रयोगों हेतु किया गया एवं शेष 365 कि.ग्रा. वीहन लाख रु. 32, 900 में बेचा गया। इसके अतिरिक्त 508 कि. ग्रा. छिला हुआ लाख (कच्ची लाख, मूल्य रु. 29, 718) भी प्राप्त हुआ।

उपाधि

श्री मौरिस एक्का (टी-4), रसायन विभाग, को बिरसा कृषि विश्वविद्यालय, राँची द्वारा मृदा विज्ञान एवं कृषि रसायन में एम. एस-सी. (कृषि) की उपाधि प्रदान की गई।

अनुसंधान की मुख्य उपलब्धियाँ

कुसुम पर बीहन लाख एवं कच्ची लाख उत्पादन की उन्नत तकनीक

कुसुम (श्लेचरा ओलिओसा) पर कुसुमी लाख कीट का प्रयोग कर बीहन लाख एवं कच्ची लाख के उत्पादन के लिए खेती की अलग-अलग तकनीक विकसित की गई।

लाख कीट के लेपिडोप्टेरस परभक्षी का नियन्त्रण

साइपरमेथ्रीन एवं फेनवेलरेट कीटनाशी के 0.002% के सांद्रण का प्रयोग द्वितीय निरुप लाख कीट पर सुरक्षित पाया गया। लाख कीट के प्रमुख लेपिडोप्टेरस परभक्षियों पर ये ओवीसीइडल सक्रियता दर्शाने वाले पाये गए।

भालिया (फ्लेमेंजिया मैक्रोफाइला) के पौध बृद्धिगुणों में आनुवांशिक विभिन्नता

लाख की खेती के लिए महत्वपूर्ण, भालिया के कुछ पौध वृद्धिगुणों का अध्ययन किया गया। प्रारंम्भिक शाखाओं की संख्या एवं टहनियों की कुल लम्बाई के लिए वंशागतित्व उच्च मान प्राप्त किया गया। जिसे चयन द्वारा आनुवंशिक सुधार के लिए प्रयोग में लाया जा सकता है।

बहुस्तरीय पद्धति के अन्तर्गत आकाशमणि (एकेशिया औरिकुलीफॉर्मिस) पर लाख की खेती

आकाशमणि पर जेठवी 1994 फसल सफलतापूर्वक उगाया गया जिससे प्रति पौध 600-800 ग्राम कच्ची लाख का उत्पादन हुआ। कटाई किये गए पौधों से प्राप्त टहनियों एवं पत्तियों का शुष्क वजन क्रमशः 80 एवं 16 क्विंटल प्रति हे. पाया गया।

वस्त्र उद्योग के लिए लाख रंजक के कैल्शियम लवण की तैयारी

लाख के परिशोधन के दौरान प्राप्त धोवन जल से लाख रंजक का कैल्शियम लवण तैयार किया गया। इस रंजक को उन की रंगाई के लिए संतोषजनक पाया गया।

एल्यूरिटीक अम्ल की तैयारी के लिए छनाई की उन्नत विधि

कैल्शियम कार्बोनेट को फिल्टर एड के रुप में प्रयोग करने से सोडियम हाइड्रोलाइसेट की छनाई की अवधि में काफी कमी होती है, जिससे प्रक्रम (प्रोसेस) पर कुल खर्च भी कम पड़ता है।

विभिन्न विभागों/अनुभागों में किए गए अनुसंधान के सारांश

कीट विज्ञान विभाग

क्रियमाण अनुसंधान

1.1.9 कुसुम (श्लेचरा ओलिओसा) पर कुसमी लाख कीट का उपयोग कर बीहन लाख एवं कच्ची लाख के उत्पादन के लिए निम्नलिखित अलग-अलग प्रबन्धन तरीके विकसित किये गए:

बीहन लाख उत्पादन

चार कूप पद्धति में छँटाई की गई, प्रति छंटाई बिन्दु पर 20 ग्राम बीहन लाख दी गई एवं इन्डोसल्फान (0.05%) और बी. एच. सी. (0.05%) के मिश्रण का प्रथम छिड़काव एक माह के फसल पर, फिर दूसरा छिड़काव अगहनी एवं जेठवी फसल पर क्रमशः नवम्बर और जून में।

कच्ची लाख उत्पादन

दो कूप पद्धति के अन्तर्गत छंटाई की गई प्रति छंटाई बिन्दु पर 20 ग्राम बीहन लाख, जून-जुलाई में एक वर्ष पुराने प्ररोह पर संचारण, फसल की परिपक्वता पर आंशिक कटाई एवं तत्पश्चात जून-जुलाई में पूरी कटाई, प्रत्येक फसल मौसम में एक महीने के फसल पर इन्डोसल्फान एवं बी. एच. सी. का मिश्रित छिड़काव।

1.1.10 आकाशमणि (एकेशिया औरीकुलीफॉर्मिस) पर लाख की खेती के लिए किए गए अध्ययन से पता चला कि(1) एक मीटर लम्बे प्रति प्ररोह पर बीहन लाख की दर 10-20 ग्राम अनुकूलतम थी, (2) फसल के संचारण के लिए 18 माह का प्ररोह सर्वाधिक उपयुक्त पाया गया एवं (3) परम्परागत परिपालकों से लिए गए बीहन लाख आकाशमणि से लिए गए बीहन लाख की तुलना में कम उपज दिया।

1.1.12 हल्की छँटाई के बाद, बेर (जिजीफस मौरीसीयाना) में छँटाई बिन्दुओं की संख्या एवं कुल संचारण क्षेत्र के बीच सकारात्मक सह-सम्बन्ध पाया गया। हल्की छँटाई की तुलना में ग्रामीणों द्वारा की जाने वाली बृहद छँटाई से संचारण क्षेत्र में वृद्धि देखी गई।

1.4.20 साइपरमेथ्रीन (विलसीथ 10 ई. सी) एवं फेनवेलरेट (फेनवल 20 ई. सी) कीटनाशी के 0.00025 सें 0.002% तक के सान्द्रण लाख कीट के द्वितीय निरुप के लिए अगहनी 1994-95 फसल में सुरक्षित पाये गए। लाख परभक्षी यूब्लीमा एमाबिलीस एवं स्यूडोहाइपोटोपा पल्वेरिया के अण्डों को इन कीटनाशियों में डूबाने या उपचारित सतह पर रखने पर ओवीसाईडल प्रभाव देखा गया।

उपरोक्त कीटनाशियों से बीहन लाख को उपचारित करने से लाख कीटों के विस्तार (कवरेज) एवं स्थापना पर कोई-असर नहीं पड़ता है।

एसाफोएटिडा एवं फॉर्मलडिहाइड के प्रतिकर्षी क्रिया (रिपेलेन्ट एक्शन) के कारण नाशीकीट के ग्रसित क्षेत्र में महत्वपूर्ण अन्तर देखा गया तथा इसका लाख कीट पर कोई विपरीत प्रभाव नहीं पड़ा। अगहनी 1994-95 की अवधि में लाख कीट से जुड़े जीवों का अध्ययन भी किया गया।

कृत्रिम आहार पर पाले गए पी. पल्वेरिया का जीवन काल आहार एवं मौसम के अनुसार भिन्न-भिन्न पाया गया।

1.5.8 तैमारा से प्राप्त लाख कीट जर्मप्लाज्म बेहतर लाईफ एवं फ्लो क्रमशः 50 मिनट एवं 70 मि. मी. दर्शाया है। रंगीनी लाख कीट के क्रीम उत्परिवर्ती (म्यूटेन्ट) का पियोर लाइन स्थापित किया गया। क्रिमसन मादा एवं क्रीम नर के बीच

संकरण के विसंयोजन संततियों के अध्ययन से पता चला कि क्रीम जीन जंगली एलेली के प्रति अप्रभावी है। कतकी फसल के मौसम में रंगीनी कीट के एक इन्ट्रेड लाईन एवं जंगली स्टॉक के मादा कीट के लाख उत्पादकता में काफी अन्तर पाया गया। लाइनों के बीच माध्यम एवं विसंगति महत्वपूर्ण नहीं था।

पादप विज्ञान अनुभाग

सम्पूरित अनुसंधान

2.2.6 भालिया के विभिन्न पौध वृद्धिगुणों के वंशागतित्व के आकलन से प्रति पौधा प्राथमिक शाखाओं की संख्या एवं प्ररोह की कुल लम्बाई के लिए उच्च मान का पता चलता है। चयन के द्वारा इस परिपालक के आनुवंशिक विकास के लिए इन लक्षणों का उपयोग किया जा सकता है।

क्रियमाण अनुसंधान

2.1.11 प्रयोग के अन्तर्गत विभिन्न लाख परिपालकों के पौध वृद्धि गुणों के अध्ययन से पाया गया कि गलवांग में पौध की उँचाई एवं मोटाई अधिकतम थी। जेठवीं 1994 लाख फसल आकाशमणि पर सफलतापूर्वक उगाई गई जिसमें प्रति पौध 600-800 ग्राम. कच्ची लाख की उपज हुई। कटाई/छँटाई की अवधि में आकाशमणि से प्राप्त टहनियों एवं पत्तियों का शुष्क वजन अधिकत्तम पाया गया।

कुसरुंत पर गुल्मवन (कॉपीसींग) एवं उर्वरक के प्रयोग संबंधी अध्ययन से देखा गया कि जमीन से 15 से. मी. की ऊचाई पर गुल्मवन करने पर बेहतर प्रभाव पड़ा। 40 कि. ग्रा. प्रति हे. फॉस्फोरस पेन्टाऑक्साइड के प्रयोग से पौधे की अधिकतम ऊँचाई एवं 40 कि. ग्रा. प्रति हे. नाइट्रोजन + 40 कि. ग्रा. फॉस्फोरस पेन्टाऑक्साइड के प्रयोग से अधिकतम मोटाई देखी गई।

2.1.13 आकाशमणि पर पौध-घनत्व, गुल्मवन (कोपिसींग) की उँचाई और उर्वरकों के प्रभाव के अध्ययन हेतु दो प्रयोग शुरु किये गए। प्रथम चरण में मानसून के दौरान परिपालक के बिचड़े उगाए गए एवं प्रतिरोपित किए गए।

2.2.7 फ्लेमेंजिया के विभिन्न प्रजातियों के वृद्धि गुण एवं उन पर उगाए गए लाख की फसल की तुलना की गई। अगहनी 1994-95 लाख की फसल एफ. सेमीआलता पर सफतापूर्वक उगाई गई जिसमें प्रति झाड़ी 270-400 ग्रा. बीहन लाख तथा 90-210 ग्रा. कच्ची लाख की उपज हुई।

रसायन विभाग

क्रियमाण अनुसंधान

3.2.15 दो अलग-अलग विधियों द्वारा एल्यूरिटीक अम्ल से आइसोएम्ब्रेटोलाइड तैयार किया गया। एल्यूरिटीक अम्ल से कन्डीडेट यौगिक के संश्लेषण के क्रम में दो विधियों से मिथाइल 9 - ऑक्सोनोनानोएट तैयार किया गया।

3.3.14 विभिन्न विधियों से लाख रंजक का कैल्शियम लवण तैयार किया गया। प्रयोगशाला में ऊन रंगने के लिए इन नमूनों का उपयोग कर संतोषजनक परिणाम मिला। लाख रंजक का कैल्शियम लवण तैयार करने की एक साधारण विधि विकसित की गई। लाख रंजक के नमूने में रंजक के मात्रा के अनुमान के लिए स्पेक्ट्रोफोटोमेट्रिक अवशोषण पर आधारित एक विधि मानकीकृत की जा रही है।

क्षारीय जल अपघटन द्वारा चौरी से एल्यूरिटीक अम्ल को अलग करने के बाद अम्ल से अपघटन के पूर्व अपक्षेपित सोडियम एल्यूरिटेट से मोम एवं अन्य अघुलनशील तत्व हटाए गए। वर्त्तमान विधि की तुलना में इस विधि से प्राप्त एल्यूरिटीक अम्ल के उत्पादन एवं शुद्धता में सुधार देखा

गया। आगे ऐसा देखा गया कि एल्यूरिटीक अम्ल के उत्पादन एवं गुणवत्ता में जल उपघटन की अवधि में दस दिन तक सुधार देखा गया।

3.4.7 गम्मी मास के साथ ताप बहुलकन प्रयोग से देखा गया कि गम्मीमास को 16.5 घण्टे के लिए 170°-175° सी. पर गर्म करने के बाद दुर्गलिनीय एवं अघुलनशील हो जाता है। आगे देखा गया कि अलकोहल में आंशिक रुप से बहुलकीकृत गम्मी मास का घोल हवा में सुखने वाले वार्निश के रुप में उपयोग नहीं किया जा सकता है। एल्यूरिटीक अम्ल को अलग करने के दौरान मातृद्रव से सोडियम क्लोराइड को पृथक किया गया।

3.5.6 डेढ़ साल के लाख आधारित अखंडित संयोजन को तिलचट्टे के उपर परीक्षण द्वारा तीन दिन के अन्दर 50% मरणशीलता देखी गई।

3.6.5 दो प्रकार के (बी 72 एवं बी 60) पौलीविनाइलएसीटल (पी वी ए) रेजींन के साथ चपड़ा के मिश्रण के परावैद्युत गुणों का अध्ययन किया गया। चपड़ा की तुलना में मिश्रणों का परावैद्युत गुण उच्चतर पाया गया। यह मिश्रण ट्रासफॉर्मर के तेल एवं ट्रैकिंग से भी प्रतिरोध दर्शाता है। पाया गया कि पौलीविनाइल एसीटेट एवं पी वी ए (बी-72) में चपड़ा की उपस्थिति से आर्द्रता प्रतिरोध में सुधार पाया गया। चपड़ा एवं पॉलीविनाइल एसीटल रेजीन एक दूसरे के अनुकूल पाए गए।

तदर्थ अध्ययनः

डिफारेनसियल स्केनिंग कैलोरीमीटर द्वारा थ्रीओ-एल्यूरिटीक अम्ल एवं इसके व्यूत्पन्नों (डेरिवेटीव) के पिघलने की स्थिति का अध्ययन किया गया। गलन संबंधी विवरण से ऑनसेंट तापक्रम, अशुद्धियाँ, क्रिस्टलीनता, विजातियता इत्यादि के बारे में संकेत मिला है।

प्रौद्योगिकी अनुभाग

क्रियमाण अनुसंधान

4.1.10 चपड़े को भण्डारण के दौरान लम्बे समय तक सुरक्षित रखने के लिए दो मंदकों, जैसे सोडियम एसीटेट एवं ट्राइईथनोलाएमीन से अलग-अलग प्रयास किया गया ट्राइईथनोलाएमीन के मामले में छः महीने बाद नियंत्रण की तुलना में चपड़े की ठंढ़े अल्कोहल में घुलनशीलता थोड़ी सी ज्यादा पाई गई।

4.4.4 एल्यूरिटीक अम्ल के निर्माण संबंधी मार्गदर्शी संयंत्र अध्ययन आरम्भ करने के क्रम में संस्थान में विकसित आधुनिकतम विधि को कई बार दुहराया गया एवं इसे पुनर्उपयोगी पाया गया। चौरी घोल के सोडियम हाइड्रोलाइसेट को छानने के दौरान कैल्शियम कॉर्बोनेट को फिल्टर सहायक के रुप में उपयोग करने पर फिलट्रेशन के समय में काफी कमी पाई गई। इस प्रक्रिया से खर्च को कम किया जा सकता है।

उपचारित धोवन जल के मातृ द्रव से शुद्ध लाख रंजक तैयार किया गया और इसकी उपज कच्ची लाख के वजन के 0.17 प्रतिशत पायी गयी। यह महोगनी रंग का था तथा ठंढ़े पानी में आसानी से घुलनशील था। ऊन एवं रेशम के तंतुओं को रंगने के लिए लाख रंजक का अशुद्ध कैल्शियम लवण भी तैयार किया गया।

प्रसार विभाग

क्रियमाण अनुसंधान

5.7 सामान्य स्थिति में रखे चपड़े की तुलना में परावैगनी (अल्ट्रा वॉयोलेट) विकिरण के अधीन रखे चपड़े में तेज गति से क्षय देखा गया। अवकर्षण को रोकने में कुछ प्रति ऑक्सीकारक प्रभावी पाये गए।

राजभाषा एकक के कार्यकलाप

कार्यालय के दैनिक कार्यों में हिन्दी के प्रयोग में प्रगति, हिन्दी को लोकप्रिय बनाने के लक्ष्य की प्राप्ति एवं इसके बहुआयामी उपयोग के लिए राजभाषा एकक द्वारा निम्नलिखित कार्य किये जाते हैं :

- संस्थान राजभाषा कार्यान्वयन समिति की बैठक का आयोजन, कार्यसूची एवं कार्यवृत की तैयारी तथा लिए गए निर्णयों पर अनुवर्ती कार्रवाई।
- वार्षिक रिपोर्ट का सारांश, कार्यालय आदेश, परिपत्र, ज्ञापन, निविदा सूचना, कोटेशन इत्यादि का अनुवाद।
- अहिन्दी-भाषी अधिकारियों, कर्मचारियों की हिन्दी शिक्षण योजना द्वारा आयोजित हिन्दी प्रशिक्षण के लिए नामित करना।
- हिन्दी दिवस, हिन्दी पखवाड़ा एवं हिन्दी प्रतियोगिताओं तथा हिन्दी कार्यशालाओं का आयोजन।
- संदर्भ साहित्य, हिन्दी पत्रिकाएँ, शब्दकोश एवं तकनीकी शब्दावलियों का उपार्जन।

राजभाषा कार्यान्वयन समिति

राजभाषा अधिनियम के प्रावधानों के अधीन निर्मित नियमों एवं विनियमों के आधार पर भारत सरकार के गृह मंत्रालय द्वारा तैयार किये गये वार्षिक कार्यक्रम में निर्धारित लक्ष्यों की प्राप्ति हेतु संस्थान में राजभाषा हिन्दी के प्रयोग की प्रगति तथा इस संबंध में आनेवाली कठिनाइयों के निराकरण हेतु उपाय करने, सरकारी काम-काज में हिन्दी को लोकप्रिय बनाने एवं समय-समय पर प्राप्त आदेशों के अनुपालन सुनिश्चित करने हेतु डेढ़ दशक पूर्व से ही संस्थान राजभाषा कार्यान्वयन समिति कार्यरत है। वर्ष 1994-95 में निम्नांकित सदस्यों की एक समिति कार्यरत रही :

डा. सतीश चन्द्र अग्रवाल, निदेशक, ***अध्यक्ष***

डा. शिशिर कुमार साहा ***सदस्य***
विभागाध्यक्ष, प्रसार एवं रसायन विभाग

श्री अंजार हुसैन नक्वी ***सदस्य***
विभागाध्यक्ष, कीट विज्ञान विभाग

डा. प्रणय कुमार ,,
अनुभागाध्यक्ष, पादप विज्ञान अनुभाग

डा. प्रेमचन्द्र गुप्ता ,,
अनुभागाध्यक्ष, प्रौद्योगिकी अनुभाग

श्री श्रीकृष्णमणि त्रिपाठी ,,
वरिष्ठ तकनीकी अधिकारी

श्री प्रदीप कुमार ,,
वित्त एवं लेखा अधिकारी

श्री नरेन्द्र कुमार शर्मा ,,
फार्म अधीक्षक

श्री राम प्रताप तिवारी ,,
पुस्तकालयाध्यक्ष

श्री हरिहर सिंह मुंडा ,,
सहायक प्रशासकीय अधिकारी

श्री लक्ष्मी कान्त सदस्य सचिव
सहायक निदेशक (रा. भा.)

उपरोक्त समिति के कार्यकलाप का संक्षिप्त विवरण :

राजभाषा कार्यान्वयन समिति की बैठकों में ली गई महत्वपूर्ण निर्णय

समिति की दिनांक 19.8.94 एवं 26.11.94 की बैठकों में हिन्दी दिवस एवं हिन्दी पखवाड़ा आयोजित करने, देवनागरी लिपि में तार विषय पर व्याख्यान आयोजित करने, हिन्दी टंकण मशीन का क्रय, संसदीय राजभाषा समिति को संस्थान में राजभाषा के प्रयोग संबंधी निरीक्षण की अवधि में दिए गए आश्वासनों की अनुवर्ती कारवाई तथा राजभाषा के प्रगामी प्रयोग हेतु आवश्यक जाँच बिन्दु बनाने का निर्णय लिया गया।

राँची नगर राजभाषा कार्यान्वयन समिति

30 अगस्त 1994 एवं 8 मार्च 1995 को आयोजित राँची नगर राजभाषा कार्यान्वयन समिति की बैठकों में संस्थान का प्रतिनिधित्व डा. सतीश चन्द्र अग्रवाल, निदेशक, श्री श्रीकृष्णमणि त्रिपाठी, वरिष्ठ तकनीकी अधिकारी और श्रीलक्ष्मी कान्त, सहायक निदेशक (रा.भा.) ने किया। बैठक में निदेशक महोदय ने हिन्दी के प्रगामी प्रयोग हेतु ठोस सुझाव समिति के समक्ष रखा।

गोष्ठी/सेमीनार में सहभागिता

राष्ट्रीय कृषि अनुसंधान प्रबंध अकादमी, हैदराबाद में दिनांक 13-17 दिसम्बर 1994 तक आयोजित "कृषि वैज्ञानिक भाषा का सरलीकरण" विषयक कार्यशाला में श्री लक्ष्मीकान्त, सहायक निदेशक (रा. भा.) ने भाग लिया एवं संबंधित विषय पर अपना आलेख प्रस्तुत किया।

राजभाषा हिन्दी को लोकप्रिय बनाने हेतु कारगर उपाय

संस्थान के विभिन्न विभागों एवं अनुभागों में कार्यरत कर्मचारियों को अंग्रेजी शब्दों के हिन्दी प्रतिशब्द सहजता से उपलब्ध करवाने के दृष्टिकोण से "आज का शब्द" का बोर्ड लगवाया गया।

प्रशिक्षण पाठ्यक्रम हेतु हिन्दी में पुस्तक प्रकाशन

संस्थान में चलाये जा रहे प्रशिक्षण कार्यक्रमों के पाठ्यपुस्तक हिन्दी में प्रकाशित कराने हेतु संस्थान के वैज्ञानिक एवं तकनीकी अधिकारीगण हिन्दी में मूल आलेख प्रस्तुत किए हैं, जिसे प्रकाशित करवाने हेतु हिन्दी पाठ्य पुस्तक प्रकाशन समिति कार्यरत है।

संस्थान का नाम भारत सरकार के गजट में अधिसूचित किया जाना

अस्सी प्रतिशत से भी अधिक अधिकारियों/कर्मचारियों के हिन्दी में कार्यसाधक ज्ञान की घोषणा प्राप्त होने पर संस्थान का नाम, भारत सरकार के राजपत्र के भाग-2, खंड-3, उपखंड-2 में राजभाषा नियम 1976 के नियम 10 के उपनियम 4 के अन्तर्गत, अधिसूचित किया गया है।

हिन्दी प्रकाशनों का उपार्जन

राजभाषा के प्रयोग में सहायक ग्रंथों एवं आवधिक हिन्दी पत्रिकाओं का उपार्जन किया गया।

प्रोत्साहन योजना

सरकारी काम काज में मूल रुप से हिन्दी में कार्य करने के लिए नकद पुरस्कार योजना लागू की गयी है।

राँची नगर राजभाषा कार्यान्वयन समिति के निर्णय के अनुपालन में राष्ट्रपति, प्रधान मंत्री, साहित्यकार, राष्ट्रनेता एवं विदेशी विचारकों के हिन्दी संबंधी प्रेरक नारों का संकलन कर आकाशवाणी द्वारा प्रसारित किए जाने हेतु अग्रसारित किया गया।

हिन्दी दिवस एवं हिन्दी पखवाड़ा-1994-95

संस्थान में हिन्दी दिवस समारोह का आयोजन 14 सितम्बर 1994 को किया गया तथा इसी दिन से हिन्दी पखवाड़ा का शुभारम्भ हुआ। इस अवसर पर संस्थान के निदेशक डा. सतीश चन्द्र अग्रवाल ने अधिकाधिक कार्य हिन्दी में करने की अपील की।

कार्यक्रम का शुभारम्भ स्वागत गान से हुआ तथा संस्थान के कर्मचारियों ने विविध सांस्कृतिक कार्यक्रम प्रस्तुत किया।

राँची विश्वविद्यालय के हिन्दी स्नातकोत्तर विभाग के प्राध्यापक एवं सुप्रसिद्ध व्यंग्यकार डा. अशोक प्रियदर्शी ने मुख्य अतिथि पद से बोलते हुए कहा कि हिन्दी को अब तक हमने अपने स्वाभिमान के साथ नहीं जोड़ा है। आज का दिन आत्ममूल्यांकन का दिन है। उन्होंने कहा कि हिन्दी संपर्क एवं राजभाषा है। उनका कहना था कि हिन्दी के विकास के लिए मानसिकता में बदलाव लाना जरुरी है।

संस्थान के निदेशक, डा. सतीश चन्द्र अग्रवाल ने अपने स्वागत भाषण में कहा कि संस्थान में 1935 से ही हिन्दी में वैज्ञानिक एवं प्रसार साहित्य का सृजन प्रारंभ किया गया था। संस्थान द्वारा हिन्दी की चार पुस्तकें 16 वैज्ञानिक साहित्य एवं 17 प्रचार साहित्य प्रकाशित हो चुके हैं। संस्थान में हिन्दी के प्रयोग को बढ़ावा देने के लिए संदर्भ साहित्य एवं पत्र पत्रिकाओं का उपार्जन किया जा रहा है। मूल रुप में हिन्दी में टिप्पण एवं प्रारुप लेखन हेतु नकद पुरस्कार योजना संस्थान में लागू की गई है। हिन्दी हमारी राष्ट्रभाषा है, इनका प्रचार प्रसार करना हमारा कर्त्तव्य है। हिन्दी हमारी राष्ट्रीय एकता का प्रतीक है। हिन्दी के प्रयोग के संबंध में हम अपने अतीत के प्रति गौरवान्वित, वर्त्तमान में सजग एवं भविष्य के प्रति निष्ठावान हैं। उन्होंने संस्थान के समस्त अधिकारियों एवं कर्मचारियों से अधिक से अधिक कार्य हिन्दी में ही करने का संकल्प लेने का आग्रह किया।

इस अवसर पर, प्रभारी हिन्दी कार्यक्रम, श्री श्रीकृष्णमणि त्रिपाठी ने "तकनीकी क्षेत्र में हिन्दी के प्रयोग की संभावना" विषय पर रोचक व्याख्यान दिया तथा श्री लक्ष्मीकान्त, सहायक निदेशक (रा. भा.), ने संस्थान में हिन्दी के प्रयोग में हुई प्रगति प्रस्तुत करते हुए सूचित किया कि प्रशासकीय कार्यों में 90% तक काम हिन्दी में हो रहा है।

अन्य कार्यक्रमों के अतिरिक्त राजभाषा हिन्दी के लिए प्रेरक एवं मनमोहक प्रदर्शनी का आयोजन किया गया जिसमें संस्थान द्वारा प्रकाशित हिन्दी में प्रसार साहित्य, शब्दकोश, पारिभाषिक शब्दावलियाँ राजभाषा विभाग तथा केन्द्रीय सचिवालय हिन्दी परिषद द्वारा प्रकाशित ग्रंथों एवं नियम की पुस्तकों को दर्शाया गया।

राजभाषा कार्यान्वयन समिति के तत्वावधान में आयोजित हिन्दी टिप्पण, प्रारुप लेखन, निवन्ध, अन्ताक्षरी, वादविवाद, सुलेख, काव्यपाठ की प्रतियोगिताओं के विजयी प्रतिभागियों को पुरस्कार एवं प्रशस्ति पत्र प्रदान किये गए।

हिन्दी दिवस समारोह आयोजन समिति के अध्यक्ष, डॉ अगस्त पाण्डेय, वरीय वैज्ञानिक, ने धन्यवाद ज्ञापन किया।

हिन्दी पखवाड़ा की अवधि में दिनांक 21 सितम्बर 1994 को श्री रमेश चन्द्र मिश्र, वरीय वैज्ञानिक, ने "छोटानागपुर में अधिकाधिक लाख उत्पादन" संबंधी संकार्य अनुसंधान परियोजना विषय पर आयोजित संगोष्ठी में हिन्दी में व्याख्यान दिया।