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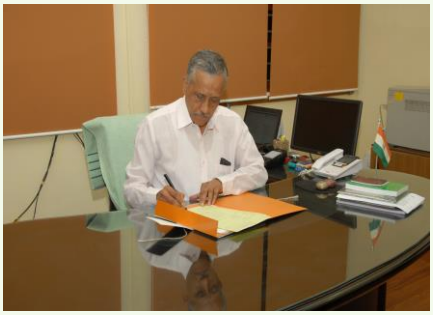
## From President's Desk.....

### Shellac-based delivery systems and probiotic formulations –Potential applications of shellac



Shellac, the only pharmaceutically used resin of animal origin with great application potential, has been widely used in the development of various delivery systems owing to its pH responsiveness, biocompatibility, and degradability. It performs better on encapsulating hydrophobic active substances than other natural polymers. Specially designed shellac-based delivery systems can also be used for the co-delivery of hydrophilic and hydrophobic active substances. Multi-scale shellac-based delivery systems from the macro-scale to nano-scale including matrix tablets, films, enteric coatings, hydrogels, microcapsules, micro-particles (beads/spheres), nanoparticles, and nano-fibers have been formulated.

However, shellac-based systems have poor stability as it is prone to polymerization. Therefore, molecular modification, compounding with other polymers, and the introduction of additives is required to adjust the performance of the system. These changes may allow shellac-based delivery systems to play an important role in the encapsulation and delivery of probiotics. Shellac based delivery systems can also be used for simultaneous detection, imaging, and treatment by introducing fluorescent substances. Emerging technologies such as 3D printing and microfluidics, are expected to promote the high-quality development of shellac based delivery systems.

Plasticizers and water-soluble polymers improve the enteric properties of shellac and shellac based probiotic formulations. Fluid-bed dried bacteria coated with shellac containing these additives protect the microorganisms against acidic pH and provide the best release profile in simulated intestinal fluid. These formulations maintain cell even after months of storage at low temperatures. Application of quercetin, a flavonoid found in fruits, vegetables *etc*.is known for its beneficial impact on the risk of cardiovascular diseases, certain cancers, and inflammation is constrained by its low bioavailability, water solubility and chemical instability. Quercetin-fortified nanoparticles prepared from shellac as the core material stabilized by almond gum and tween 80 has overcome these challenges. Shellac-xanthan gum nanoparticle system may be used as a carrier of polyphenols for improving the health-promoting properties of food as it effectively improves the thermal stability of the polyphenol-rich cinnamon extract. Nanoparticle formulations based on shellac and chitosan have been used as a protein delivery system also.

Although shellac has been considered a safe material and has been approved by the FDA as a food additive, its fate in the human body needs to be further understood. A shellac-based delivery system in a macroscopic state can be considered finally degraded and removed from the body under the action of the intestinal flora and the pH of the colon but, micro-nano-delivery systems may be absorbed in the digestive tract when used for oral administration. Shellac is expected to be used in fabricating functional food systems to deliver functionally active substances. Therefore, with the growing interest in green health, the application of shellac in delivery and food systems is expected to increase.

### *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae), major stored grain pest of *Flemingia* spp

*Flemingia macrophylla* (Willd.) and *Flemingia semialata* (Roxb.) are perennial woody shrub belonging to family Leguminosae. They are described as short duration, good, commercially exploited lac host plants. The plant is very fast growing and takes only one year for its establishment. The lac cultivation can be done continuously up to 7-8 years after the establishment of the plant. *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae), is considered as the major stored grain pest of pulses. It causes weight loss, decreased germination potential and reduction in the commercial value of the seed. The infestation begins in the field and continues in the storehouses causing heavy losses. The climate of North East India is more favourable for rapid multiplication of stored grain pests. High temperature, high relative humidity and high precipitation during the monsoon period favour the rapid growth and development of stored pests (Fig. 1 and 2). Last 3-4 years research on *Flemingia* crop shows that *C. chinensis* is an important pest causing 90% yield losses during storage of *Flemingia* seeds.

The management of stored products is generally done through fumigation but it is not advisable to practice in the villages because the storage structures are not airtight. Moreover, synthetic insecticides have some limitations and undesirable side effects including health hazards to consumers, residual toxicity, environmental pollution and development of resistance against insect pests. Sometimes persistent insecticides accumulate in the higher food chain of animal and human and become concentrate by biomagnifications. This situation dictates the need for safe, locally available and less expensive materials for pest control in storage. Moreover, entomopathogenic fungi like *Beauveria bassiana* (Bals.) Vuill., *Metarhizium anisopliae* Sorokin, botanical pesticides like citronella oil, lemongrass oil, patchouli oil, neem oil, black gram powder are also potential insecticides which are utilized for controlling of this noxious pest. These are eco-friendly, safer to the non-target organisms killed the target insect pests. However, very less attention has been paid to use of these microbes and botanicals against this stored grain pest.

**Fig. 1.** *C. chinensis* egg laid on *F. semialata* seed

**Fig. 2.** *C. chinensis* damaged *Flemingia* seeds

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### Occurrence of lac insect in North East India

The Northeast region comes under the Indo-Burma biodiversity hotspot which ranks 6$^{th}$ among the 25 biodiversity hotspots of the world. Biodiversity of the North East is a genetic treasure of a wide range of plants and animals making it rich in diversification of various species of flora and fauna.

In the field surveys conducted during 2015-2022 lac insects were discovered on several new host plants in different North Eastern states as shown in the Table 1

**Table 1: Natural lac incidence in North Eastern States**

| New Host plant | Place/ District | State |
|---|---|---|
| Common name: Mango; Botanical name: *Mangifera indica*; Family: Anacardiaceae | Imphal west | Manipur |
| Common name: Indian Silk Cotton Tree; Botanical name: *Bombax ceiba*; Family: Malvaceae | Imphal East | Manipur |
| Common name: Champac plant; Botanical name: *Magnolia champaca;* Family: Magnoliaceae | Imphal West | Manipur |
| Common name: White Hibiscus; Botanical name: *Hibiscus rosa chinensis;* Family: Malvaceae | Lairenjam, Bishnupur | Manipur |

| | | |
|---|---|---|
| Common name: Wild hops; Botanical name: *Flemingia strobilifera;* Family: Fabaceae | Chandel | Manipur |
| Unidentified host plants (Associated with ant nesting of *Crematogaster species*) | Yaralpat, Imphal East | Manipur |
| Unidentified host plants | Sangaithel, Imphal West | Manipur |
| Common name: Blue Jacaranda; Botanical name: *Jaccaranda mimosifolia;* Family: Bignoniaceae | Sendra, Bishnupur | Manipur |
| Common name: Indian Rose chestwood tree; Botanical name: *Mesua ferrea*; Family: Calophyllaceae | SASARD Campus, Medziphema | Nagaland |

In Manipur lac insect was commonly found on *Malvaviscus penduliflorus*. The incidence of lac insect was also observed infesting other host plants like *ber*, *Mallotus sp*., *arhar*, *Ficus sp*, litchi, etc. The lac encrustations found on *Malvaviscus sp.*, *ber* and *Mallotus sp.* were associated with ant nesting of *Crematogaster*sp.). In Nagaland in spite of having lots of potential host plants like *Malvaviscus sp*., *Ficus sp*., *arhar* etc. lac insects were restricted to litchi plant only. Similarly in Arunachal Pradesh also the incidence of lac insect was observed only on the litchi plants. In Tripura there is no evidence of lac insects; however, many potential host plants like *Malvaviscus sp*., *Ficus sp*., *arhar*, *ber* etc. were found growing at road side as well as in the residential areas. In Sikkim lac insect was found on *M. penduliflorus*. The survey programme in Mizoram reveals that like Nagaland and Arunachal Pradesh in spite of having lots of potential host plants like *Malvaviscus sp., Ficus sp*, *arhar* etc. lac insects were restricted to litchi plant only but in different conditions. The lac insect of Mizoram on litchi plant was associated with ant nesting of *Crematogaster sp.* whereas ant nesting was not observed in the lac insect found in Nagaland, Arunachal Pradesh and Sikkim. The survey programme in Meghalaya reveals that the host plants of lac insect was found restricted to *Ficus sp*. only. The lac insect found in Meghalaya was totally different in aspect of crop cycle with the lac insect found in Manipur, Nagaland, Arunachal Pradesh and Mizoram. The crop cycle of lac insect of Meghalaya is similar with the common Indian lac insect *Kerria lacca* whereas the crop cycle of lac insect found in Manipur, Nagaland and Arunachal Pradesh is different. In these states, lac insect life cycle ranges from October- November to June-July (summer season crop) and from June-July to October-November (rainy season crop). In Meghalaya many lac growers were found cultivating lac insects and lac dye preparation was done by using traditional methods for local consumption. The farmers sold *phunki* lac at Rs. 400/kg. According to the farmers consent due to the shortage of market channel, commercialization of lac insect has been restricted to local consumption only. Most of the lac growers follow their old aged traditional methods by using bamboo baskets, bamboo straps etc. and no scientific intervention of lac insect cultivation has been made. They used only *Ficus sp*. as host plant of lac insect for the entire village and no other host has been known except *Ficus sp*.

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### Entrepreneurial ecosystem for tribal agriculture development: A case study of Lac Integrated Agro-forestry System (LIAS)

Agriculture is the foundation of the civilization, culture and heritage of India. Its complex mosaic of distinct agro-ecosystems opens new vistas of integration to diversify and more sustainability. A success story of farmers (*viz*., Shri. Jaganu Oraon, Shri. Radheshyam Bediya and Shri. Laldev Bediya at Hesatu, Mungadih, Ranchi district) who adopted different models of the Lac Integrated Agro-forestry systems in Jharkhand is documented to highlight the socio economic benefits among the tribal communities. Survey and field visits were carried out under the collaborative project of ICAR-Indian Institute of Natural Resins and Gums, Ranchi and World Agro-forestry, New Delhi entitled "Enabling tribal communities to improve their livelihoods through Agro-forestry systems on a sustainable basis" during 2018. Lac based agro-forestry model is very profitable and provides additional income from different crops. Team surveyed around ten farms, out of which three farmers showed interest and adopted this model. All three farmers were

aware of the lac cultivation but not aware of the new bushy plants, *Flemingia semialata*, *Calliandra calothyrsus* and its integration with other fruits and vegetables. *F. semialata, C. calothyrsus*., and fruit trees were introduced in the lac based agro-forestry model in the fields of identified farmers. Benefit cost ratio under the model was estimated as 3.54. Benefit cost ratio under the various models ranged from 2.10 to 5.70 across various villages.

A farmer from Hesatu village of Ranchi district adopted the lac based agro-forestry model (*Palas* +*Semialata* +*Callinadra* +Vegetables). Two farmers from Mungadih village of Ranchi district adopted the lac based agro-forestry model (*Ber* + *Semialata* +*Callinadra* +*Vegetables*+Papaya) (Fig. 3 and 4). Quality planting materials (*viz*. *Semialata*, *Calliandra*, papaya and vegetables) and broodlac were provided to the three farmers. Provision of non-credit inputs including lac production kit and pest management kit enabled the beneficiaries to adopt the recommended practices. Three farmers *viz*., Shri. Jaganu Oraon, Shri. Radheshyam Bediya and Shri. Laldev Bediya earned ₹1.48 lakhs, ₹2.07 lakhs and ₹0.6 lakhs, respectively during the two years period 2019-20 to 2020-21 through this model by spending an amount of ₹0.443lakh, ₹0.287 lakh, ₹0.197 lakhs cost of production and thus earning a net profit of ₹1.04 lakhs, ₹1.79 lakhs,₹0.4 lakhs, respectively. The ICAR-Indian Institute of Natural Resins and Gums Namkum , Ranchi organized On-Farm Training cum Field Day on "*Calliandra calothyrsus* - A good host in Lac Integrated Agro-forestry System" to promote the necessary awareness among farmers at Mungadih, Angara block, Ranchi district on 20th January, 2021. Around 150 farmers from 10 different villages participated in the field day cum training program. By viewing the successful models, most of the farmers were impressed and motivated to adopt these models in the coming season. Becoming a successful farmer under the model with a net profit of ₹1.79 lakhs, Shri. Radheshyam Bedia received the Excellent Lac Farmer Award 2021 at *Kisan Mela* cum Agriculture technology exhibition at ICAR-IINRG from the Honourable Jharkhand Chief minister, Shri. Hemant Soren. All three farmers have now become masters in promoting scientific lac cultivation and lac integrated agro-forestry model to many farmers from different villages and districts of Jharkhand. Shri. Jaganu Oraon became a master trainer of promotion of scientific lac cultivation on *F. semialata* under the scheme of Jharkhand MGNREGA programme. Shri. Radheshyam Bediya has trained and motivated more than 25 farmers with scientific lac cultivation techniques. Their achievement has become a source of inspiration to other farmers for lac cultivation.

**Fig. 3.** Before intervention of LIAS Model at farmers' field of Hesatu and Mungadih villages in Ranchi district

**Fig. 4.** After intervention of LIAS Model at farmers' field of Hesatu and Mungadih villages in Ranchi district

***A. Mohanasundaram, J. Ghosh, R K Yogi and K K Sharma***
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**A legendary tycoon of lac sector: Journey from Punjab to Jharkhand**

At 85 Shri. Roshanlal Sharma is the senior most person in the lac business, having experience of about 7 decades in lac industry. He can rightly be called a living encyclopedia of Lac business and industry, having seen the evolution and ups and downs in the history of lac in India and abroad.

Although he hails from Punjab, he came to Jhalda (presently in West Bengal) in 1956 and also worked in Calcutta office Achhruram Kalkhof (Shellac) Private Limited. In 1964 he was sent to Murhu (presently in Jharkhand) to build a new factory

for the company, where he worked as manager. As the company was growing he was assigned to open new purchase and production centres in other lac producing areas of Palamu (Jharkhand) Madhya Pradesh, Maharashtra and West Bengal. Meantime he also extended and increased the production capacity of the company's Murhu factory to 4-5 times which by the time in 1982 was the largest shellac and seedlac producing factory in India.

In 1983 he decided to set up his own industry and business and rented a small (cottage) factory in Khunti (presently in Jharkhand). After running the rented factory for three years he bought a piece of land by the side of river Tajna and built his own factory in Khunti with the financial assistance from Bihar State Financial Corporation and named the factory as Tajna Shellac factory. As his business was growing so with the financial support from the State Bank of India the factory was converted into a Private Limited Company in 1993.

In 1997 another unit for the production of value-added shellac was formed and named as Tajna River Industries Private Limited in financial and technical collaboration with M/s Kane International Corporation, New York USA. The US is the largest buyer of shellac and seedlac in the world.

He lost his mother at a tender age of 5 which was compensated partially by the nurturing from his grandmother. The situation changed after the death of his grandmother when he had to go to Gorakhpur to live with his father and stepmother. He was a bright student who was offered scholarship by the esteemed colleges of Banaras Hindu University. Soon he found an escape from step motherly treatment and decided to move to Jhalda at the age of 18 leaving his academic education halfway to work in Indian Shellac factory Jhalda.

That was his first contact with lac. He picked up work quickly and put in his best efforts. Subsequently, for this he made the contact with the experts of Indian Lac Research Institute (ILRI), Ranchi and got the help of legendary publications entitled "Chemistry of Lac" and "Monograph of Lac" at the Institute library. He was trained for testing and analytical analysis of different qualities of Lac samples under the guidance of the then director Dr. S V Puntambaker of ILRI, Ranchi which is by the way the only research institute for lac research in the world.

In 1962–63 when the Murhu Seedlac Factory was formed he was then sent to Murhu from Kolkata with his wife and son to this factory. He took over production of seedlac and worked very hard to supply the best quality seedlac to M/S Kalkhof GmbH Petersen und Stroever in Frankfurt / Mainz in Germany. The company had three units in Mainz, Hamburg and Bremen). In 1957 When Dr. Kalkhof Rose visited India. Shri. Roshanlal Sharma met him, and his wife Mrs. Rose and it was the beginning of a long lasting business relationship with them which still continues with Mrs. Rose who is at present 96 year old, after the death of her husband.

His training in the Lac Research had helped him to make trials of making value added shellac while employed in the company and with the help of ILRI, Ranchi, he was very happy when he could succeed in making two tons of bleached shellac in 1975. In 1980 Late Shri. Sohanlal Bahl owner of the company provided him the opportunity to get training at the factories of Kalkhof GmbH Petersen und Stroever Germany for production of bleached shellac as per the proper quality standard specifications. He worked with the same spirit and enthusiasm but decided to leave in 1982 for personal reasons.

Once again, he had to start from scratch, but his experience, courage, faith and confidence inspired him to start making seedlac in a small rented building in Khunti, Jharkhand. He got the first order for seedlac and handmade shellac from Europe in 1986. He continued manufacturing various grades of seedlac (Fig. 5) and handmade shellac. In the year 1988-89, the production of machine-made shellac was also added to fulfill the quality requirements of the Indonesian buyers. Shri. Sharma desired to work on high value product lines as there were demands for lac dye and bleached lac from the overseas market. In 1990-91, Shri. Sharma got the training on value added product of aleuritic acid, lac dye and for increasing the shelf life of bleachedlac at ILRI, Ranchi.

He took more time in visits to Europe and USA. Finally, in 1997 the production of value added improved quality bleached lac was introduced. Thereafter, Tajna River Industries Private Limited, Khunti was established with a capacity of 50 tons per month. He had also started the production Orange shellac in Jakarta, Indonesia in partnership with an Indonesian businessman of Jakarta to cater to the requirements of Indonesian customers which worked for ten years and had to be closed because the cultivation of lac had greatly reduced in that country.

**Fig. 5.** Drying of seedlac at Tajna Shellac Private Limited, Khunti

During the journey of more than 60 years in the lac sector his entrepreneurship could generate employment for the local tribals. In both of his factories about 1500 tons of raw sticklac is processed to produce different qualities of value added grades of seedlac, shellac, bleached lac, lac dye and other by products which earns a valuable foreign exchange for the country and provides employment to about 100 tribal workers.

His attitude towards business has been guided by humility and oneness with all. He is constantly in touch with the latest development in lac and with ILRI now known as Indian Institute of Natural Resins and Gums with which he has an old association and is still enthusiastically guiding his own R&D laboratory with vital tips on shellac. He is also member of the advisory committee of Research and development of the Indian Forest Institute of Productivity in Ranchi.

Having come a long way from a simple boy from Punjab to a successful industrialist and exporter, he can look back and attribute his success to devoted hard work, dedication, openness to learning, curiosity, global attitude, gratitude and optimism. The great importance he gives to honesty in all his dealings with his suppliers and customers in the overseas markets. He has never become bitter with failure or hardships but remained grateful and gracious about what life has bestowed on him. Today, he keeps himself fit by getting up at 3 a.m. and following a disciplined regimen of Yoga, *Pranayam* and meditation

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## Gum-based hydrogel as a promising dye adsorbent

Water pollution generated from industrial effluents and other sources contributes towards maximum imbalance in the ecosystem. Among such contaminants, dyes remain potential threat to water system. Dye contaminated water have adverse effects on various aquatic lives and biomass synthesis in many hydrophytes as it reduces the photosynthesis process which in turn increases biological oxygen demand (BOD). Most synthetic dyes are extremely difficult to be removed or degraded through municipal treatment plants. There are many techniques employed in large scale to treat dye contaminated water coming from industrial effluents such as coagulation, adsorption, precipitation, filtration, electrolysis etc. Nevertheless, all these techniques have their own drawbacks since they involve use of metals which can lead to secondary problems. Therefore, it is necessary to adopt techniques that are affordable, ecofriendly, fast, comfortable, by-product biodegradability, high chelating property and re-usability which is met in plant-based adsorbents such as plant gums (Fig. 6 and 7).

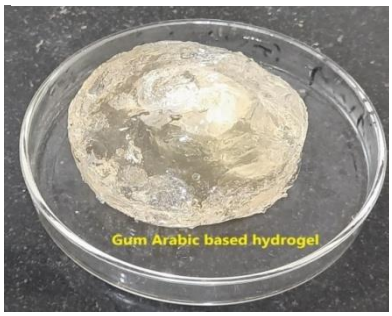


**Fig. 6.** Gum Arabic based hydrogel


**Fig. 7.** Gum Arabic hydrogel employed as dye adsorbent

However, the raw gum cannot be used directly as it has some drawbacks such as thickening, drop in viscosity on storage, uncontrolled rate of hydration and poisoning by microbes. Therefore, it is necessary to modify native gum either by grafting or cross-linked with suitable chemicals. One of the best techniques commonly employed for grafting is microwave irradiation which involved selective excitation of the polar bonds, which can be a site for grafting of desired molecules.

Using microwave irradiation technique gum Arabic based hydrogel was synthesized. The reaction involved addition of monomer and cross-linker under intermittent irradiation until a gel like mass was produced. The irradiation was then stopped at 70 $^{0}$C and resulting gel like mass was precipitated with an excess of acetone. The final pure product was collected, dried, crushed and sieved for further uses. The use of microwave assisted technique for grafting polymer is reported to be effective and convenient method from many studies as it offers quick result, efficient and easy to handle. The synthesized hydrogel was employed as an adsorbent for removal of dye from water. The result revealed that plant-based adsorbent can be an excellent alternative for environmental remediation.

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## Tropical fruits: Potential source for value addition and higher income generation to the farmers of Uttara Kannada district, Karnataka

Tropical fruits are now considered as an important source of commerce as they have gained enormous market potential during present days. Tropical fruits, which are at present

underutilized, have an important role to play in satisfying the demand for nutritious, delicately flavoured and attractive natural foods of high therapeutic value. They are rich in vitamins, minerals and dietary fibre and therefore are an essential ingredient of a healthy diet.

Most fruits are seasonal and highly perishable and post-harvest losses in India are estimated to be 3-16% which amount to a whopping ₹ 92,651 crores. In times when time is of essence, food that can last longer with high nutritional value is preferred by the customer. That is where preservation of fruits through value addition comes in. People do not want to preserve fruits at home and want food that can easily be consumed and are healthy at the same time.

Value addition is the need of the hour due to changing market trends and changing lifestyle. Value added products presently gaining popularity in the foreign market and are good foreign exchange earners.

Fruits can be converted into value added or preserved products such as canned mangoes, fruit juices, salted cashews, dehydrated foods, and frozen fruits. Value addition can be achieved by processing the fruits into liquid, semi-solid and solids forms.

Liquid forms include unfermented beverages (pure fruit juice, fruit juice beverage, squash, cordial, crush, fruit juice concentrate, RTS, nectar, syrup, sarbat, barley water, carbonated beverage) and fermented beverages (alcohol, vinegar), puree, sauce, ketchup etc. Semi-solid forms include pulp, jam, jelly, marmalade and chutney. Solid forms include canning, drying, preserves, candy and pickling (Fig. 8).



Kokum Juice Blackberry Juice



Amla Juice Mango Juice Lemon-ginger Juice

**Fig. 8.** Value added products prepared from tropical fruits by Shri., Dinesh Bhat, Uttara Kannda, Karnataka

Uttara Kannada is endowed with vast resources of *Garcinia indica, Artocarpus heterophyllus, Syzygium cumini, Mangifera indica, Emblica officinalis, Buchanania lanzan, Carissa carandus, Annona squamosa, Flacourtia montana*, *etc.*
Many farmers were doing value addition to fruits of these species on small scale in Uttara Kannada, Karnataka and producing juice, squash, chips, jam, jelly, *etc* and improved their livelihood by earning higher income.

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## Beads/decorative seeds: Potential source for value addition and income generation

Beads are the hard spherical or oval stony inner portions of the seeds of the fruit and produced from variety of plants *viz.,* trees, climbers, shrubs. Normally plants produce seeds with wide variation in colour, size and shape. These variations create decorative/attractive look to the seeds and used for production of variety of decorative ornaments. Since past decorative seeds are used for several purposes such as weighing gold, making buttons, bracelets, ear rings, necklaces, *etc.* There are several species in Karnataka which produce decorative seeds *e.g., Abrus precatorius* (Gulaganji), *Adenanthera pavonina* (Bead tree), *Balanites aegyptiaca* (Desert date), *Caesalpinia bonducella* (Fever nut), *Elaeocarpus sphaericus* (Rudraksh), *Entada scandens/E. phaseoloides* (Ganape kayi balli), *Calamus viminalis* (Cane), *Nelumbo nucifera* (Lotus), *Putranjiva roxburghii* (Child life tree). Value addition of seeds of these species provides employment to the tribals or unemployment youths and helps in improving their livelihood.



**Fig. 9.** Seed based value added products produced by Final B.Sc. (Forestry) students, College of Forestry, Sirsi, Karnataka

Final B.Sc. Forestry students of College of Forestry, Sirsi, Karnataka, since 2017-18, under Forestry Experience Learning

(FEL) produced several value added products using seeds of different species. Seeds of *Abrus precatorius* (Gulaganji), *Adenanthera pavonina* (Bead tree), *Balanites aegyptiaca* (Desert date), *Caesalpinia bonducella* (Fever nut), *Entada scandens/E. phaseoloides* (Ganape kayi balli) were used for manufacture of ear rings, bracelets, key chains, *etc.* By value addition of decorative seeds, they earned entrepreneurship skills and profit with B:C ratio of 2:1. Hence, there is a lot of scope for value addition of forest seeds by the tribal people and unemployment rural youth and improvement of their livelihood (Fig. 9).

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**Nation observes 1st National Lac Insect Day on May 16, 2022**


IINRG, Ranchi took initiative to observe 1st National Lac Insect Day (N-LiD) on May 16, 2022 and also the Productive Insects Conservation Week during May 16 – 22, 2022 (Silk Day on May 18th, World Bee day on May 20th and World biodiversity day on May 22nd). N-LiD was celebrated across the country by organizing awareness campaigns, expert lectures and field days for farmers, students, faculty and other stakeholders.

To commemorate the occasion, earlier on May 13th a Memorandum of Association (MoA) was signed between ICAR-IINRG, Ranchi and IIT (ISM), Dhanbad for implementation of the project on, 'Inclusive Agriculture Ecosystem for Jharkhand: Application to Fin-tech and Block-chain' for designing an integrated block-chain and Artificial Intelligence enabled platform that will allow farmers, FPOs, organizations, processing and consuming industries, digital lenders and importers to connect on a single platform. The project aims to design an integrated blockchain and artificial intelligence enabled platform that will allow all players involved in lac farming, FPOs, digital lenders, processing units, industries, and importers to connect on a single platform.

On this occasion, Dr. KK Sharma, Director of the Institute highlighted the importance of beneficial insects, especially the lac insect, in the ecosystem services and livelihood security of the dependent human population. He also highlighted the need of conservation efforts to protect the beneficial insect biodiversity available in the country (Fig. 10).

**Fig. 10.** Celebration of 1st National Lac Insect Day on May 16 2022, at ICAR-IINRG, Ranchi

Network Cooperating Centers of Network Project on Conservation of Lac Insect Genetic Resources *viz*., AAU, Jorhat; CAU, Imphal; PAU, Ludhiana; ANGRAU, Guntur; MPUAT, Udaipur; SKUAST, Jammu; KFRI, Thrissur; SFRI, Jabalpur; ICAR-RCER, Patna; KVK Sirsi, UAS, Dharwad and two centers of Network Project on Harvesting, Processing and Value Addition of Natural Resins and Gums *viz*.,, JNKVV, Jabalpur and Forest College and Research Institute, TNAU, Mettupalayam actively participated in the event (Fig. 11-20).

H.E. Governor of Jharkhand; Hon'ble Chief Minister of Jharkhand; Central Government Ministers of Agriculture and Farmers Welfare; Tribal Affairs; Commerce and Industry; DG, ICAR; DG, ICFRE; Chairman, Biodiversity Authority of India; DDG (Engg.); ADG (FE) and Directors of Research Institutes congratulated and appreciated the initiative taken by the IINRG for successful organization of 1st National Lac Insect Day.

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***ICAR-IINRG, Ranch***

**Fig. 11.** AAU, Jorhat, Assam

**Fig. 12.** MPUAT, Udaipur, Rajasthan

**Fig. 13.** KFRI, Thrissur, Kerala

**Fig. 14.** SKUAST-Jammu, Jammu & Kashmir

**Fig. 15.** ANGRAU, Guntur, Andhra Pradesh


**Fig. 16.** CAU, Imphal, Manipur


**Fig. 17.** FC&RI, Mettupalayam, Tamilnadu


**Fig. 18.** PAU, Ludhiana, Punjab

**Fig. 19.** SFRI, Jabalpur, Madhya Pradesh

**Fig. 20.** JNKVV, Jabalpur, Madhya Pradesh

**Celebration of 1st National Lac Insect Day at different Institutes**

## National Lac-insect Day: Relevance and significance

Lac-insects are the crowning glory of India's rich insect fauna. Of the nine genera and 101 species of lac insects reported from the world; two genera and 28 species are found in our country, representing 27.7% of the lac-insect species diversity. The insects belonging to *Kerria* genus are exploited for their products of commerce viz., resin, dye and wax as lac insects not only contribute to livelihood security, but they also are key to conserving biodiversity - a cornerstone of the Sustainable Development Goals. Lac-insect genetic resources in the country exist in the form of a vast array of populations which have evolved and adapted over many centuries,
to the range of environmental conditions resulting in several breeds, types and strains each adapted to its own specific niche.

The lac-insect genetic resources of the country are under threat due to the disappearance of a substantial number of local populations, with the consequent loss of their inherent genetic adaptation to their local environments. Conservation is of particular concern in regions of rapid agricultural change, where farming methods are being replaced or lac farming has been abandoned. Lac insects face main challenges today, from intensive agriculture, pesticides, to climate change. The absence of an appropriate habitat for lac insects could lead to a continuous decline in lac production. Mono-cropping, pesticides and higher temperatures associated with climate change all pose problems for lac insect populations.

One glaring example of this is drastic decline in *rangeeni* lac production especially the summer season (*baisakhi*) crop.

Recognizing the crisis of decline in lac insect biodiversity and its links to human livelihoods, the Research Advisory Committee of the Institute suggested to observe National Lac-insect Day (N-LiD) to create awareness about the socio-economic importance of lac farming. The issue was discussed thoroughly during Institute Management Committee and decision arrived at to celebrate N-LiD on Mid-day of May every year to underscore the importance of *baisakhi* crop as most of this crop (which was once the commercial crop) is harvested as *ari* (immature) during the month of May and make efforts to: (i) Monitor decline in lac insect population, its causes and its impact on ecological services; (ii) Address the lack of taxonomic information on lac insects; (iii) Assess the economic value and impact of the decline of lac insect; and (iv) Promote the conservation and the restoration and sustainable use of lac insect diversity in agriculture and related ecosystems.

Let us take pride in celebrating the day; work with dedication to restore the glory of lac and make the conservation and sustainable use of lac a priority.

***KK Sharma***
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