Notes and News

Awarded CSIR Technology Award for Life Sciences-2011 to CSIR-NEIST-Jorhat.Assam

The Technology Award for Life Sciences awarded to CSIR-North East Institute of Science and Technology (CSIR-NEIST), Jorhat for 'Developing *Terminalia chebula* based bioformulation (Muga Heal) as an anti-flacherie agent and a silk fibre enhancer' The technology was developed by a team headed by Dr.BG Unni, Chief Scientist & area Coordinator (/Biological Sciences), Dr.PG Rao (Director) CSIR NEIST and Dr. S.B..Wann.(Scientist) . The award was presented to the team by Hon'ble Minister of Science & Technology and Earth Sciences & Vice President CSIR Shri Vilasrao Deshmukh in the presence of Dr.Ashwani Kumar Minister of State for Science & Technology, Earth Sciences and Planning, Dr.R.A.Mashelkar Former Director General CSIR, National Research Professor and Prof. Samir K. Brahmachari, Director General, CSIR and other diginatories at the CSIR Foundation day celebration held on 26th September 2011 at Vigyan Bhavan, New Delhi

Muga silkworm (*Antheraea assamensis,* Helfer), the economic insect is unique, prerogative and geographical indicator to the North Eastern region of India. Current information appeared in one of the national dailies shows that the production of Muga in 2007-2008 and 2008-2009 was about 105 metric tones while in 2009-2010 it was about 90 metric tones. The golden yellow yarn produced by this insect is lustrous, highly durable, strongest and toughest of all natural silks having multifarious utilities for which its demand is increasing in world fabric market. The silkworm is polyphagous, multivoltine (5-6 crops per year), semi-domesticated in nature, the worms are reared outdoor on standing trees. On maturity, the worms crawl down at the end of completion of five larval instars, are collected by rearers, and allowed to spin cocoons inside rearing house. Muga silkworm feeds primarily on "Som" (*Persea bombycina* King ex. Kost.) and "Soalu" (*Litsea monopetela* Pers.). The other food plants include "Diglotti" (*Litsea salicifolia* Roxb. Ex. Wall.) and "Mejankori" (*Litsea citrata* Blume) are of secondary importance. Because of its rearing outdoor the muga silkworms, *A. assamensis* are exposed to the adverse climatic conditions, pests and predators. In muga silkworms the disease which affects large population of silkworms usually during the hot and humid summer climatic conditions results in high mortality,which affects the silk production and even those surviving there is decrease in their silk producing capacity. The diseases associated with pathogenic bacteria come under the general term "flacherie" which refers to the flaccid condition exhibited by infected silkworms due to different ailments. A potent bacterial strain of *Pseudomonas aureginosa* Strain AC-3 has been identified in the Biotechnology Laboratory of CSIR-North East Institute of Science & Technology as the organism which causes the flacherie disease of muga silkworm. About 60-70% loss of muga silkworms has been estimated to be accountable due to infection of this bacterial strain, which mainly occur during the later part i.e. 4th-5th larval instars. A protein from the bacteria exhibiting toxic affect on the health of the silkworm larvae was also purified and characterized. Recurrence of death due to various diseases caused by different agents including bacteria is an integral phenomenon and a burning problem of the muga silkworm rearers for successful crop harvest. Unfortunately, till date, no report is so far available for controlling the diseases of muga silkworm. As it is a highly sensitive organism towards chemical treatments, use of bio-formulations of plant, bacterial or animal origin is considered as the best alternative for conducting experiments on management of the diseases of muga silkworm. Therefore, attempts of first kind were made by the research team in the Biotechnology Division headed by Dr. BG Unni and his team with the traditional folk medicinal plants extracts in controlling the flacherie of the muga silkworm and a potent bioformulation " MUGA HEAL" from the *Terminalia chebula* fruits has been developed. Application of the bioformulation enhances the biting habit of the silkworm to consume more food. It is highly effective in controlling the dreaded disease 'flacherie' in muga silkworm thereby reduces the rate of mortality of larvae from 90-100% to 25-30%. It is an eco-friendly material/ substances and non toxic to the silkworms/ host plants. The bioformulation enhances the pupal weight, Shell weight and Cocoon weight and Silk yield from 15-20 %. The larvae fed with bioformulation treated *Persea bombycina* leaves showed higher yield in non-breakable filament length up to 30-40% with better quality and higher quantity of silk than the untreated plants. The use of

Terminalia chebula based bioformulation by sericulture farmers in large scale would uplift the economic status of the weaker section. ❐

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Escalating Danger of Japanese Encephalitis in Uttar Pradesh

Japanese encephalitis is a fatal infectious disease caused by a virus which spreads by biting of mosquitoes in human beings. It is an ideal example of neglected tropical disease. Neglected tropical diseases are those diseases which almost exclusively affect poor people living in rural areas or urban slums of underdeveloped and developing nations. They can be fatal, but they primarily cause chronic lifelong disabilities, leading to disfigurement, impaired child development, poor pregnancy outcomes and impaired worker productivity. On national and regional scales, their effects are so severe that these diseases are considered conditions that promote and perpetuate poverty. Dengue, leptospirosis, onchocerciasis, schistosomiasis, leishmaniasis, buruli ulcer, leprosy, chagas diseases are the other examples of neglected tropical diseases.

Japanese encephalitis disease has emerged as a major health problem in Uttar Pradesh. The Gorakhpur and adjoining districts of Eastern Uttar Pradesh are worst affected from the disease. Of the total 75 districts of Uttar Pradesh presently the disease has been reported from 35 districts which include Gorakhpur, Maharajganj, Deoria, Kushinagar, Santkabir Nagar, Siddharthnagar, Ambedkarnagar, Gonda, Bahraich, Shravasti, Basti, Balrampur, Mau, Azamgarh, Ballia, Ghazipur, Jaunpur, Allahabad, Pratapgarh, Fatehpur, Sultanpur, Barabanki, Rae Bareilly, Saharanpur, Faizabad, Lucknow, Unnao, Sitapur, Khiri, Kanpur city, Hardoi, Bareilly, Muzaffarnagar, Shahjahanpur and Ghaziabad. However, Gorakhpur district of Eastern Uttar Pradesh is the epicentre of the disease in Uttar Pradesh. Japanese encephalitis in Uttar Pradesh was reported first time in 1978, however, since last 6 years it has emerged as a serious health problem especially in Eastern Uttar Pradesh. Besides Uttar Pradesh, Japanese encephalitis in India has been reported from the states of Bihar, Jharkhand, Assam and Andhra Pradesh.

Medical surveillance in Eastern Uttar Pradesh reveals that among all infected 80% is represented by children. Thus children are more susceptible to this disease compared to adults. Of the total infected children 82% belongs to the rural areas. Moreover, of the total infected children 74 % belongs to extremely poor families whose income ranges between Rs.12,000 to 24,000 per annum. Therefore, most of children die due to lack of appropriate treatment. Maximum number of causalities from the disease occurs in rainy season, as the mosquito population inflates in rainy season.

According to the Government sources, from January 2005 to December 2010 there have been 4,311 deaths by Japanese encephalitis in Uttar Pradesh. There were 1593, 528, 545, 537, 556 and 552 deaths from the disease in the year 2005, 2006, 2007, 2008, 2009 and 2010, respectively. In 2011 till September 376 causalities were reported from the disease in Uttar Pradesh

Water logging and pig farming (in human settlement areas) are the two most important predisposing factors for the development and spread of Japanese encephalitis. The disease is spread by the biting of *Culex* species of mosquito, which generally breeds in stagnant water bodies like ponds, pools, tanks, canals, rivers and in waterlogged paddy fields, therefore water logging provide ideal breeding grounds for the mosquitoes. The mosquitoes pick the virus from the pigs and occasionally from some birds (which are supposed to be the major reservoirs of the virus) and transmit to the human beings.

Japanese encephalitis is not a haemorrhagic disease like dengue. It is mainly a brain fever therefore in India vernacularly the disease is known with the name *Mastishka jwar* or *Dimagi bukhar*. Mild infections occur without apparent symptoms other than fever with headache. However, more severe infection is marked by quick onset of headache, high fever, neck stiffness, stupor, disorientation, coma, tremor, occasional convulsions and spastic paralysis. Recent survey reveals that children surviving the disease may have chance of having dwarf stature.

Japanese encephalitis is detected through cerebrospinal fluid test, which comprises antibodies against the virus in the infected person.

The disease has no specific treatment. However, if the Japanese encephalitis is diagnosed in early stage then it is curable by the use of antipyretics and antibiotics.

Since vaccine is available against the disease, hence 100% vaccination needs to be ensured to control the disease. As a precautionary measure mosquito nets and mosquito repellents should necessarily be used to avoid mosquito bite. Water logging should be avoided in the surroundings of human settlement. Temporary ponds and pools produced in rainy season should be strictly destroyed. Ponds, tanks and canals should be treated with insecticides at regular intervals for the control of mosquitoes.

Malathion fogging should also be necessarily done at regular intervals to keep the mosquitoes at bay. Since marigold (*Tagetes erecta* and *Tagetes patula*) possess mosquito repellent property, hence cultivation/plantation of marigold should be done on large scale in rainy season in surroundings of the human settlement and also in residential compounds to deter mosquitoes. In addition to these, mosquito larvae feeding fish *Gambusia aphinis* (introduced from Italy in 1929) should be left and allowed to flourish in the wetlands. Similarly at the same time fresh water turtles, which feed the mosquito larvae should also be left in the ponds, rivers and canals for the control of the mosquito population. The fungi like *Leptolegina caudata* and *Aphanomyces lavis* parasitizing the mosquito larvae should also be used as bio-control agents to check the mosquito population. Aquatic plants like *Pistia lanceolata* and *Salvinia molesta* which favour the breeding of *Culex* mosquito should be harvested and destroyed especially during the rainy season. Water logged paddy fields serve as an ideal breeding ground for the mosquitoes, hence least water requiring paddy varieties should be brought in cultivation to avoid the water logging in paddy fields. Moreover, waterlogged paddy fields should be infested with water fern *Azolla pinnata* which deter the breeding of mosquitoes. *A. pinnata* shall also serve as bio-fertilizer for paddy crop. Siltation often causes to the overflow of canals in rainy season leading to the problem of water logging. Therefore, desiltation of canal is essential after regular intervals to avoid the overflow of the canals.

Since pigs are the major reservoir of the virus, hence pig farming should be done far from human settlement areas. Unhygienic conditions also favour the disease development hence all possible efforts should be made to maintain neat and clean environment in the surroundings.

The escalating danger of Japanese encephalitis in Uttar Pradesh is a matter of serious concern and needs immediate attention to control and eradicate the disease which mainly afflicts the innocent children belonging to lower stratum of the society. ❐

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Impact of Introduced African Foodfishes in India – Recollecting Events on IYB 2010

Freshwater fishes are the most threatened group of vertebrates on earth after amphibians. Distinguished biologists P. K. Talwar and A. G. Jhingran's work on inland finfishes of India (*Ref: Talwar, P. K. and Jhingran, A. G. 1991. Inland fishes of India and adjacent countries. Oxford & IBH Publishing Co., New Delhi. Vol. 1-2: i-xvii + 1-1158pp*) lists 930 species comprising freshwater (warmwater and coldwater) and brackishwater environments; out of these, 102 species have been listed in threatened group of which 51 are vulnerable, 37 are endangered and 14 are critically-endangered. United Nations proclaimed 2010 to be the International Year of Biodiversity (IYB) with the theme "Biodiversity is life, biodiversity is our life" to raise public awareness of the importance of biodiversity and the consequences of its loss. 'Introduction' means the act of releasing or liberating one or more individuals of a new species. While speaking on the occasion of National Seminar on Biodiversity Conservation and Management of Aquatic Resources at Fisheries College and Research Institute, Tuticorin, Tamil Nadu during December 9-10, 2010, Dr M. C. Nandeesha, Dean of the college had explained the impact of introduction of African catfish and tilapia on our indigenous mostly non-cultivable small and medium-sized fishes. He emphasized that rural population depend highly on such fishes for nutrition in many parts of India and more attention must be paid on their role in aquaculture enhancement, livelihood security and conservation needs.

Exotic fishes can cause severe reduction of native population through predation and competition for food and space, progressively erode away local genetic diversity by hybridizing with the indigenous species (mixing of exotic genes) and reduce ecosystem productivity. In the year 1978, the African sharp-tooth catfish *Clarias gariepinus* (Burchell, 1822), a native of rivers Niger and Nile first entered into Indian inland water bodies, i.e. West Bengal from Bangladesh in 1993. The fish was introduced for immediate gains realizing that it grows very fast (more than 1kg in six months; 50-70tonnes production/ha/4-6 months) in culture ponds, resistant to disease, hardy and feeds on cheap feed like agriculture bye-products, slaughterhouse waste, chicken droppings. Its culture requires little management. But soon it was observed that the fish is non-compatible, highly carnivorous; the generalized feeding habits and mobility make this fish an extremely efficient voracious predator posing a threat to indigenous fish population outside of its native range. Due to its large size (anything between 8-15kg), it has a devastating impact on the natural population of finfishes at all trophic levels, its widespread culture practice in secrecy by private entrepreneurs mostly in Punjab, Assam, West Bengal, Tripura, central Maharashtra and Western Ghats have posed considerable threat to the existence of our endemic magur *Clarias batrachus* throughout the country. It has entered into some reservoirs and major rivers and in Bangladesh, 56 species of indigenous freshwater fishes are now threatened due to the appetite and offensive nature of this invasive species. In many parts of Asia, hybrids of introduced *C. gariepinus* with native species dominate aquaculture ponds and may pose threats to the purity and viability of natural fish populations. African catfish was unofficially introduced into Nepal in 1996-'97 by fry traders from India. According to CIFRI scientists, indigenous magur *Clarias batrachus* has medicinal value and is highly priced (Rs 180/- per kg of 80gm size); fish culturists harvest *C. gariepinus* of 70-80gm to confuse and deceive the buyers and earn higher profit. Its nature prompted Government of India to ban its culture practices in the country. Despite the ban, clandestine breeding and fry (40-60mm stage) production of this "hybrid magur" and even transport goes on in 33 hatcheries of North 24 Pgs district of West Bengal besides other places and other north-eastern states. The African catfish has even emerged as a serious threat to native fish species in rivers and rivulets in Coimbatore, Tamil Nadu with a real danger of local variety being wiped out. Remarkably in Bangladesh, there has been a decline in vulture populations due to the collection of all animal carcasses to feed to this fish in captive culture conditions.

Originating from Africa, the Java tilapia *Oreochromis mossambicus* (Peters, 1852) had mainly found its way into the country through unofficial transplantation from Bangladesh by private entrepreneurs. Both *O. mossambicus* and Nile tilapia *Oreochromis nilotica* (Linnaeus, 1758) (which attains a greater size) have posed a serious concern over survival and growth of other cultivable finfishes in culture systems due to their prolific reproduction capabilities (at 80-90mm size, 2-3 months age) and voracious feeding habit. Due to its earlier maturity, it has greater tendency to overpopulate. From aquaculture systems, it has escaped in natural waters displacing major carps (*Labeo rohita*, *Catla, catla*, *Cirrhinus mrigala*) and in Amaravathi reservoir, Coimbatore it has disturbed the stable ecology of aquatic system and threatened the existence of some minor carps like *Puntius ticto, Puntius sophore* and *Labeo kontius*. In Tamil Nadu, tilapia has adversely affected the pond culture practices of milkfish *Chanos chanos* and pearl spot *Etroplus suratensis*. The uncontrolled natural breeding of tilapia in ponds has led to excessive recruitment, stunted growth and a low percentage of marketable-sized fish. In Vaigai reservoir, *O. mossambicus* has displaced all other species including carps; at sizes less than 60mm, the fish is known to predate on major carp spawn (6-7mm stage) besides competing for food in nursery ponds. The fish (particularly Java tilapia, it never grows beyond 190gm) assumed the dimensions of a pest in still water bodies. It has been found to destroy fertilized eggs of major carps in cloth *hapas* fixed in hatchery ponds. In Jaisalmer lake, Rajasthan and in ponds of Ranchi, Hazaribagh in south Bihar, its presence has out-competed many local species and resulted in reduction of average weight of marketable-sized Indian major carps. It has also found access in backwaters of Kerala displacing the local species *E. suratensis*. In East Kolkata wetlands, Nile tilapia *O. nilotica* is being extensively cultured in domestic sewage-fed water bodies. It may attain 40-45cm in length. While culturing tilapia, there is no need to stock the pond with fish seed and fish farming in sewage-fed ponds does not require any separate application of feed and fertilizer. Thus culture of Nile tilapia became an endeavour of earning without any significant expenditure. For small-scale resource-poor fish farmers, Nile Tilapia may be useful; however, in more capital intensive aquaculture it is considered to be a competitor or trash fish. Dr Nandeesha opined that tilapia has potential for high yields, but particularly for those countries that do not have indigenous species of commercially cultivable value. In India, more indigenous species that can be cultured on profitable basis should be identified in priority and evaluated. ❒

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