Humbling Arrival of an Exotic Parasitic Wasp to Tackle Invasive Cassava Mealybug Menace in India

The use of cassava as a human food and in the form of value addition has increased in the recent years in India. Being an industrial crop, there is a vast scope for area expansion in our country. India is the fifth largest producer of cassava tubers in the world. It is cultivated predominantly in the southern states of which Tamil Nadu and Kerala are responsible for 51.9% and 31.7% of area and 57.8% and 34.9% of production respectively. It is also grown in Andhra Pradesh, Nagaland, Assam, Meghalaya, Karnataka, Madhya Pradesh and to some extent in Pondicherry, Tripura, Mizoram and the Andaman & Nicobar group of Islands. The productivity of cassava in India is impressive with 27.92 t/ha as against the world average 10.76 t/ha. Absence of any major biotic threats is one of the factors responsible for higher productivity. However, the increased globalization and trade have made India a target for entry of many new alien insect pests. One such unintentional recent introduction is the cassava mealybug (CMB), *Phenacoccus manihoti* Matile-Ferrero (Pseudococcidae: Hemiptera) on cassava during 2020.

P. manihoti is one of the most destructive pests of cassava in the world. It is native to South America, but has become acclimatized throughout sub-Saharan Africa since its unintentional introduction into the continent in the early 1970s causing up to 84% loss of yield and endangering the subsistence of about 200 million people. Among the Asian countries, it has first invaded Thailand 2008 and then spread to other neighbouring countries. In India, the occurrence of this pest was first observed on around 2000 square meter experimental plot of cassava in Thrissur, Kerala during 2020. Thereafter its severity was noticed in Tamil Nadu with severe reduction of tuber yield.

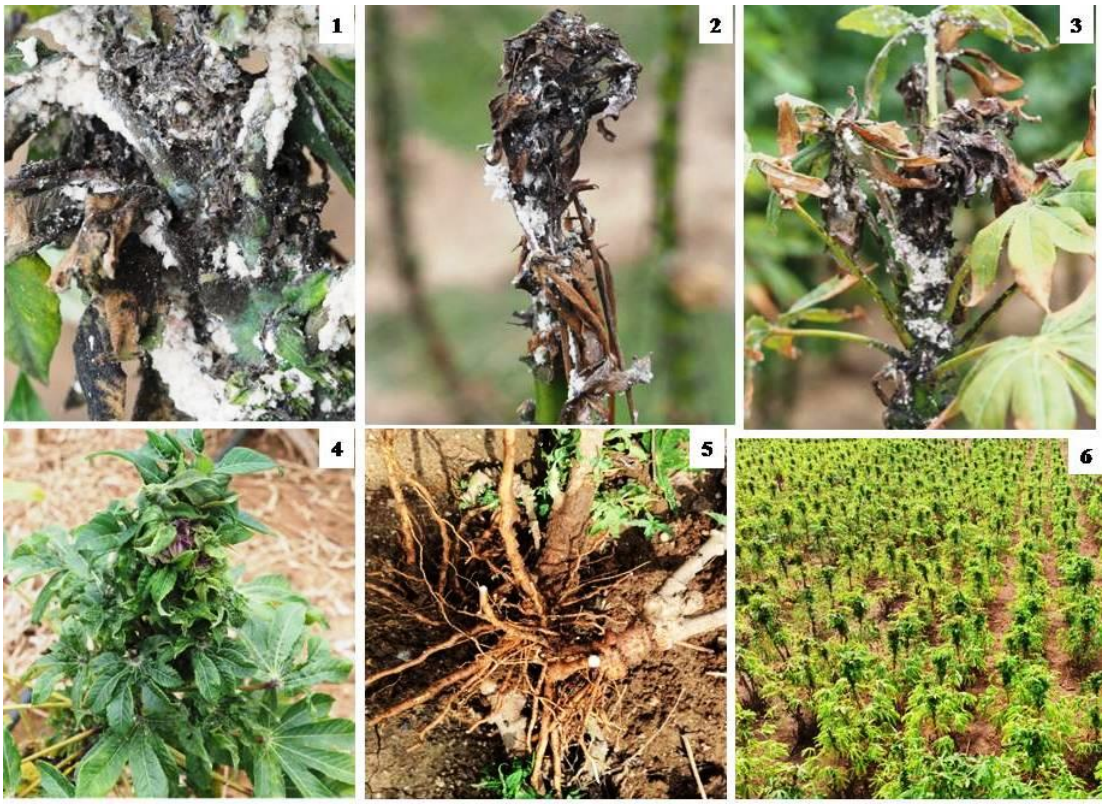

Figure: Cassava mealybug damage and severe tuber yield reduction in cassava

A large-scale biological control campaign by International Institute of Tropical Agriculture (IITA), Nigeria, in collaboration with numerous national and international organizations has led to the successful control of *P. manihoti* through the introduction and establishment of a parasitic wasp, *Anagyrus lopezi* (Encyrtidae: Hymenoptera). Presently the parasitoid wasp has been established in 26 African and four Asian countries, imparting a substantial reduction in the population density of CMB in most farmers' fields.

In the absence of any effective native natural enemies and other methods of control, CMB is posing a major crisis to the cassava industry in India. The prospects of its suppression by classical biological control are quite vibrant. After a year long struggle, ICAR-NBAIR, Bengaluru has imported the parasitoid wasp, *Anagyrus lopezi* from the IITA sub centre located in Republic of Benin, West Africa. (Govt. of India import permit No. 1712020-21 dated 29.10.2020). As per the MTA signed between IITA and NBAIR, the first shipment of the parasitoid wasp arrived India on 1 July 2021. Due to long hours in transit, no parasitoids could be alive upon arrival. Fortunately, the parasitoid cocoons from second

consignment received on 13 August 2021, could survive and the emerged parasitoids are being maintained at NBAIR QC-2 quarantine facility.

Figure: Male and female wasps of *Anagyrus lopezi*

The mandatory quarantine studies on biology, safety and host specificity of the *A. lopezi* was undertaken to ensure its non-target impacts. Field release and subsequent evaluation will be undertaken to show the value and short comings of existing natural enemies, to provide insights into the biotic and abiotic factors regulating its population size and to demonstrate the effectiveness of the introduced *A. lopezi* on the colonies of cassava mealybug.

Meanwhile, ICAR-NBAIR has optimised the mass production protocol of this parasitoid wasp. Trainer's training programmes are being conducted by NBAIR to the staffs of SAUs, state departments and KVK on the aspects of mass production and release protocols in line with the model of classical biological control programme of papaya mealybug in the country, wherein ICAR-NBAIR swiftly acted by introduction of three exotic biocontrol agents, *Acerophagus papayae, Anagyrus loecki, Pseudleptomastix mexicana* from APHIS, Puerto Rico during 2008 and saved 1,623 crores to the country. Presently, the papaya mealybug is under control because of the permanent field establishment of these parasitoids.

Similar to its success elsewhere, the newly imported parasitoid wasp, *A. lopezi* is expected to check the cassava mealybug menace in India. The parasitoid wasps will be field released once the limited area release permit is granted by Directorate of Plant Protection and Quarantine (DPPQS), Ministry of Agriculture and Farmers Welfare, Government of India.

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