



CABI News Bulletin Asia

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News and Stories

MARA-CABI Joint Lab's research aiding progress towards more sustainable management of invasive species threats



The Chinese Ministry of Agriculture and Rural Affairs (MARA)-CABI Joint Laboratory for Biosafety has made good progress in identifying sustainable management approaches for seven major transboundary, invasive crop pests.

This was revealed in a review of the Joint Lab's 2022 research activities during the 15th meeting of the Joint Lab Steering Committee, which was held at CABI's centre in Delémont, Switzerland on 24 March 2023.

Scientists from the Joint Lab, its affiliated European lab and the Lab`s Chinese subcentres provide new biocontrol solutions for green mirid bugs (Apolygus lucorum), fall armyworm (Spodoptera frugiperda), brown marmorated stink bug (Halyomorpha halys), spotted lanternfly (Lycorma delicatula), yellow-spined bamboo locust (Ceracris kiangsu), maize lethal necrosis disease and wheat aphid (Diuraphis noxia).

In addition to its research output, the Joint

Lab, which is based in Beijing, continues to play a bridging role in some major triangular collaboration and South-South co-operation initiatives.

This includes facilitation of agricultural technology transfers from China to other countries under the 'Chinese Technology Going Global' programme, and the consolidation of Plant Protection International Consortium under the framework of the 'Belt and Road Initiative.'

It also includes a Chinese Ministry of Science and Technology-funded project – "Monitoring and sustainable control of trans-border grassland pests in China and Mongolia."

The bridging role of the Joint Lab is supported by a growing number of sub-centres, such as the MARA-CABI European Lab in Delémont, Switzerland, the Yunnan-CABI Sub-centre for Integrated Prevention and Control of Transboundary Pests, the Shandong Sub-centre for Biological Control, and the Anhui Sub-centre for Agricultural Pest Control, as well as partner Joint-Labs, such as that of CABI and Malaysian Agricultural Research and Development Institute.

Yunnan Province is not only one of the largest producing areas for paddy rice, tea and tropical fruit in the world, but also a major pathway for transboundary pests and diseases that include the yellow-spined bamboo locust.

A recent Joint Lab research paper published in Frontiers in Physiology sheds new light on factors affecting the emergence and migration of this pest.

Work through the Joint Lab also includes capacity building and training activities in sustainable and integrated pest management. For example, the PlantwisePlus programme continues to work with local governments to build a network of plant clinics.

In 2022, 15 new plant clinics were established (bringing the total to 140 in China) and 75 new plant doctors were trained on how to help farmers diagnose and mitigate plant health problems in order to grow healthier and more profitable crops.

Dr Ulrich Kuhlmann, CABI's Executive Director of Global Operations and Co-Director of the Joint Lab said, "Collaboration on research, talent training, the sharing of data and the utilisation of digital tools is essential if we are to produce more safe and nutritious food for a growing population while being sensitive to the needs of our fragile planet."

The review and planning for the Joint Lab preceded a visit of the Senior Delegation Group from the Chinese Ministry of Agriculture and Rural Affairs (MARA) to CABI's corporate office in Wallingford, UK, to further strengthen collaboration between the two parties.

Dr Peng Tingjun, Deputy Director General, Department of International Cooperation, MARA and also CABI Executive Council member for China, was among the Chinese contingent that also included Dr Guan Dahai, Deputy Director, European and Central Asian Affairs Division, Department of International Cooperation, MARA.

During the visit, CABI staff provided an overview of the organisation's new Medium-Term Strategy 2023-2025 (MTS). This seeks to tackle some of the biggest challenges facing humanity, including hunger, poverty, gender inequality, climate change and the loss of biodiversity.

The MARA Delegation updated CABI on the latest priorities and policies in China for sustainable agricultural development and international cooperation in agriculture.

The Senior Delegation Group and senior CABI officials also discussed a broader framework for the strategic partnership between China and CABI. The aim is to further implement the joint action plan between China and CABI and facilitate collaboration among CABI Member Countries.

Dr Daniel Elger, CABI CEO, said, "We are grateful to China and our other Member Countries for their partnership in shaping and delivering our latest strategic plan. The ongoing successful collaboration between China and CABI reflects our mutual commitment to work together on global agendas aligned with the SDGs."

Dr Peng said, "I am pleased to see that CABI's new Medium-Term Strategy addresses key issues of concern to China. Established almost 15 years ago, the Joint Labs have shown a sustained capacity to contribute to food security and biosecurity, significantly contributing towards agricultural development in China and beyond."

Additional information

Main image: 15th meeting of the Steering Committee of Chinese Ministry of Agriculture and Rural Affairs (MARA)-CABI Joint Laboratory for Biosafety held at CABI's centre in Delémont, Switzerland on 24 March 2023. British High Commission checks progress of sensor-based pheromone trap to tackle fall armyworm pest in India



The British High Commission in India has checked the progress of a state-of-theart method for tacking the fall armyworm *(Spodoptera frugiperda)* pest with a sensorbased pheromone trap that can be operated remotely anywhere in the world.

Senior officials Sarah Fallon, Regional Director, Science and Innovation, and Swati Saxena, Senior Science and Innovation Advisor, visited a pilot site maize farm in Maramatakki village as part of the project funded by the UK Foreign, Commonwealth & Development Office's (FCDO) Science and Innovation Network in India.

The work to develop a new sensor-based pheromone trap for the fall armyworm is being led by CHAP together with consortium partners CABI, food chain data specialists Knowmatics and sensor experts Ystumtec. The project is also being delivered in conjunction with the M S Swaminathan Research Foundation (MSSRF).

Fall armyworm is a highly invasive pest and has already caused major damage to maize crops in the south of India. In Pudukkottai, for example, scientists from MSSRF said the area under maize cultivation reduced to 1,600 acres in 2022 from 6,000 acres in 2018 due to the pest.

Monitoring of the fall armyworm, which are

caught in the automatically operated sensorbased pheromone trap, can be carried out anywhere as data is transferred from satellite to remote devices such as a mobile phone, tablet or laptop computer.

The sensor-based pheromone trap, if proven to be successful, could be used to monitor and prevent the fall armyworm from spreading as well a range of other Invasive Alien Species as part of a sentinel network or strategy in India.

Dr Vinod Pandit, Programme Leader at CABI, said: "The fall armyworm has been spreading fast both within and between countries as it was predicted to do so by experts when it first landed in Africa.

"The use of sensor-based pheromone technology aims to help extension workers and smallholder farmers be more prepared to manage the fall armyworm and, potentially, other crop pests which can severely impact upon their yields and livelihoods."

According to Knowmatics CEO Derek Scuffell, in a story posted by CHAP, the device could also provide the background data needed to establish affordable pest risk and surveillance services used by farmers, distributors, and agribusinesses. This would be to implement appropriate pest control that supports more sustainable farming, reduces costs on the farm, and lifts socio-economic outcomes.

Currently, farmers are using excessive amounts of chemical pesticides to control the fall armyworm. However, this can result in environmental damage, a reduction in beneficial insects and the depletion of soil fertility.

The sensor-based pheromone trap is seen as being part of a more environmentally-friendly and safer-to-use approach to monitor and manage the fall armyworm and other pests as part of an Integrated Pest Management approach to the problem.

Dr Ramasami Rajkumar, Senior Scientist at

MSSRF, told the New Indian Express, "This new intervention will help to establish evidence-based sustainable approaches for monitoring and managing the pest, which is location-specific.

"This new monitoring tool has sensors and will be able to track the worms. We tested it at two farms in Pudukkottai and it yielded successful results. Now, we are planning to implement this at 10 farms in Pudukkottai."

The visit from the British High Commission was facilitated by Dr Rajkumar and was also attended by M. Periyasamy, Joint Director of Agriculture.

Also, in attendance was Dr R. Ramesh, Entomologist, National Pulses Research Centre (NPRC) of Tamil Nadu Agriculture University, block Agriculture department officials, experts from Puskaram College of Agriculture sciences, men and women farmers and other stakeholders.

Additional information

Main image: The sensor-based pheromone trap for fall armyworm is demonstrated at the pilot site in Maramatakki village, India (Credit: MSSRF).

Workshop reviews Pakistan's organic policy plans for more sustainable food and cotton production



CABI's centre in Pakistan, together with project donors Laudes Foundation, has convened a workshop to review Pakistan's plans for an organic agriculture policy which will ensure a more sustainable approach to food and cotton production. The move is part of an ambitious plan to promote organic agriculture in Pakistan and help alleviate poverty and mitigate the impacts of climate change.

Organic agriculture is a rapidly growing industry that has the potential to provide significant benefits to farmers, consumers, and the environment.

It minimizes the use of costly synthetic fertilizers, pesticides and herbicides. It also makes agriculture more sustainable and economically viable.

However, the policy landscape is constantly evolving and it is important to periodically review and update to ensure that the plans being created are effective and responsive to the needs of farmers, consumers and other key stakeholders.

As part of the CABI-led project 'Building the policy ecosystem for organic production in Balochistan, Pakistan,' the workshop was held at the National Agricultural Research Centre (NARC), Islamabad, and included representatives from CABI, the Pakistan Agricultural Research Council (PARC) and the Ministry of National Food Security & Research (MNFSR).

The project itself aims to develop a sustainable organic agriculture landscape that includes a robust and widely accepted organic agriculture policy, standards and regulation, and new business models at local levels that support organic agriculture.

It will support efforts to address issues regarding organic agriculture promotion including clear policy gaps and the unavailability of good quality organic seed and bio-inputs, making them available to those who need them – the producers.

Waseem Ishaq, Project Manager Organic Agriculture Policy-CABI, outlined the objectives of the project to the workshop and highlighted that linkages among industrial actors, federal and provincial level offices to enhance the availability of quality organic seed and bio-inputs will also be created.



Waseem Ishaq speaks at the workshop (Credit: CABI).

Mr Ishaq said, "Conventional farming practices rely heavily on the application of chemical inputs and high-yielding varieties which has affected soil fertility and led to a loss in topsoil, organic matter and crop production.

"Due to increases in input costs and stagnant market prices of agricultural outputs, conventional farming also brings small profits. It is these factors and practices that pose a serious threat to future food security and has highlighted the role of sustainable agricultural systems.

"This workshop provided an important platform for stakeholders to come together and foster an open dialogue and debate to build support for the organic agriculture policy amongst policymakers and the public."

At a launch workshop for the project in October 2021, Mr Syed Fakhar Imam, the Federal Minister for MNFSR, said there is a "dire need to promote organic agriculture for safe and healthy food to local and international populations."

He added that there is also need for more efficient water management practices for future generations and a reduction in greenhouse gas emissions from the chemical-intensive conventional agriculture production system.

CABI's efforts in leading the policy development work was appreciated and it was recognised that the creation of the organic agriculture policy will play a pivotal role in boosting the domestic organic industry.

Additional information

Main image: The review workshop was an important platform to discuss the country's plans for policies and regulations towards greater organic agriculture 0 including the production of food and cotton (Credit: CABI).



Agreement strengthens food security and sustainable food system in Vietnam



CABI has signed a Memorandum of Understanding with the Vietnam Academy of Agricultural Sciences (VAAS) which will see the two parties working together to further help strengthen food security and development of a responsible and sustainable food system in Vietnam.

The signing ceremony was conducted virtually, chaired by Assoc. Pr. Dr Dao The Anh, CABI Liaison Officer and Vice President of VAAS, and witnessed by Dr Qiaoqiao Zhang, Membership Director of CABI.

The agreement, which will also see the establishment of a dedicated VAAS-CABI Project Office in Hanoi, aims to bolster Vietnam's capacity to carry out long-term international cooperation in agricultural science and technology. This includes, for example, the sustainable management of crop pests and diseases.

It also features additional collaboration on research and projects such as the CABIimplemented Standards and Trade Development Facility (STDF) 'safer spices' project as well as help mitigating pests such as the fall armyworm.

Vietnam is one of the world's largest producers of peppercorn exporting an estimated 220,000 tonnes a year to over 100 countries including high-value markets in Europe and the United States. The 'safer spices' project aims to secure market access through improved food safety within the peppercorn value chain.

It is anticipated that the agreement with VAAS will help with the development of novel technologies for sustainable management of crop pests and diseases – including coffee berry borer on Vietnam's coffee crops – as well as using safer-to-use and more environmentally friendly biological control solutions as part of Integrated Pest Management (IPM) strategies.

Dr Ulrich Kuhlmann, CABI's Executive Director of Global Operations, said, "Vietnam has been a valued Member Country since its' joining CABI in 1992. Our agreement with VAAS and the creation of a dedicated joint office at their headquarters in Hanoi is a further step towards greater capacity building in research and the field to help increase the country's agricultural production, export ability, economic gain and overall food security."

The enhanced partnership will also help increase the use of pest risk analysis tools, sanitary and phytosanitary (SPS) measures and the monitoring of Maximum Residue Limits (MRLs) for pesticides applied as part of improvements along the food value chain.

Professor Dr Nguyen Hong Son, President of VAAS, said, "VAAS has a long history of collaboration with CABI. Vietnam's agricultural sector has entered into a crucial transformation stage, not only increasing the productivity but also improving the food quality and enhancing the competitiveness of agri-food value chains in the domestic and international markets.

"CABI is regarded by VAAS as a very promising partner organisation to work together and implement collaborative projects/programmes to address agricultural development needs in the country and southeast Asia region."

Dr Feng Zhang, CABI's Regional Director, East & South-East Asia, added, "CABI-VAAS collaboration has included help to foster good agricultural and hygiene practices in peppercorn and spices value chains as well as the creation of digital tools to help mitigate issues such as major pests and diseases of coconut – another economic crop for Vietnam."



A smallholder farmer receives advice on his crop pest and disease issues at a Plantwise Plant Clinic in Dak Lak, Vietnam (Credit: CABI).

Another way in which CABI has been supporting smallholder farmers in Vietnam is through the Plantwise programme which, in collaboration with CABI, has seen the Plant Protection Department of the Ministry of Agriculture and Rural Development, Southern Horticultural Research Institute (SOFRI) and Western Highlands Agriculture and Forestry Science Institute (WASI) establish 25 plant clinics.

These facilities, which include 35 guides and 63 factsheets written with the support of VAAS, strengthen the capacity of extension staff to

deliver quality plant health advice through plant clinics and complementary extension approaches.

They also work by strengthening the linkages between plant health system stakeholders – leading to better targeting and coordination of farmer support.

Through CABI's engagement and further technical discussions with Sustainable Management Services (SMS) Vietnam, for instance, a project in 2019 sought to train plant doctors on safe pesticide use on coffee plants in Vietnam.

This included the calibration of equipment, use of Personal Protection Equipment, the safe manipulation of pesticide and pesticide resistance management.

Other work and services CABI have provided in Vietnam include training farmers in sustainable pomelo production, researching youth engagement in the country's agriculture and providing Vietnam with free access to CABI's Crop Protection Compendium and Pest Risk Analysis Tool.

Additional information

Main image: CABI's agreement with the Vietnam Academy of Agricultural Sciences (VAAS) will help ensure greater food security in Vietnam which is one of the world's main exporters of peppercorn (Credit: CABI).



The online MoU signing ceremony between CABI and VAAS (Credit: CABI).

Study recommends greater awareness of biopesticides to help fight locust outbreaks in China



A new study led by scientists from the Chinese MARA-CABI Joint Laboratory for Biosafety suggests greater awareness of biopesticide market availability, efficacy and field application processes could help tackle locust outbreaks in China.

The researchers, who outline their findings in the journal Sustainability, argue that future studies should also focus on modelling the expected impact and cost effectiveness of chemicals verses biopesticides – therefore increasing the evidence base for promoting more environmentally friendly biopesticide use.

Locusts are among the world's most destructive pests that cause significant financial loss and ecological damage in many parts of the world. In China, the scientists highlight that locust outbreaks have a 3,000-year history and – along with floods and droughts – are considered the three biggest natural disasters for the country.

They add that successes have been achieved by using emerging technologies – including spraying of the locusts using drones, GPS tracking, GIS mapping and satellite data imagery – but chemical pesticides in China and other countries remains the primary method of control for the pests.

Though, China has made great strides with the

use of biopesticides, the researchers stress and further highlight that a reason why chemical pesticides are chosen is due to their fast action despite more negative impacts on the environment.

The scientists say that the uptake of biopesticides remains low due to various factors including inconsistent field results, shorter product life, high costs and effectiveness on a smaller range of pests as compared to other products. Despite this, there is increasing evidence of the benefits of biopesticides in general, including for locusts.

Dr Hongmei Li, lead author of the paper and Senior Scientist, based at CABI's centre in China, said, "Our findings show that China has an integrated national locust response protocol, which involves various institutions from all administrative levels of government.

"The process is inherently highly complex but efficient with multi-sectoral agencies working closely together to prevent and/or manage locust outbreaks.

"In addition, the process has been successful in combating recent outbreaks, due to dedicated government funding, decisive administrative and technical actions as well as the empowerment of local government administration."

She adds that this is particularly the case with the county level acting as a 'first responder' that is financially and technically able to respond to a locust invasion in their jurisdiction.

Co-author, Dr Mariam Kadzamira, Senior Researcher, Agribusiness, based at CABI's head office in Wallingford, UK, said, "Our research also shows that despite the availability of biopesticides in local markets, their use is dampened by inadequate information about market availability, negative perceptions by decision-makers about their efficacy and concerns about their costs as well as limited knowledge of their application techniques.



Locusts attacked by the fungus Metarhizium sp. (Photo courtesy of CSIRO/via scienceimage.csiro.au (CC BY 3.0).

"Actions are, therefore, needed by relevant authorities to enhance stakeholder awareness of biopesticide market availability, efficacy and field application processes."

The researchers stress that to increase the use of biopesticides for locust control there should be evidence-based local exemplars and case studies, and where possible, this should include comparisons with the long-term outcomes of using biopesticides verses chemical pesticides on locust populations.

They further add that since pest outbreaks necessitate quick and decisive actions for success, information packages should be made available to decision-makers on an on-going basis – not just when there is an outbreak. Dr Hongmei Li added, "In addition, other research should centre around metrics-based process mapping that includes analysing the time lag between strategic actions during a locust outbreak." Dr Kadzamira highlighted that this would "facilitate a better understanding and mapping of work flows and would contribute to improving the efficiency of different actors across all relevant administrative structures, in the event of a locust emergency." The scientists based their research on Yunnan Province as a case study as it was one of the worst areas affected in the 2020 locust invasion. It was also chosen as efforts to control the locusts during this invasion were relatively successful and, therefore, understanding the processes could inform future management of the pest, for China, as well as for other countries.

Additional information

Main image: The desert locust (Schistocerca gregaria) is one of the world's most destructive migratory pests (Credit: Pixabay).

PlantwisePlus News & Stories

CABI signs agreement to help improve food security in Pakistan



CABI has signed an agreement with the Government of Punjab to help improve food security in Pakistan through the implementation of the recently-launched PlantwisePlus programme.

A ceremony was held on 7 April 7, 2023, in Agriculture House, Lahore, to mark the signing of a Memorandum of Understanding (MoU) between CABI's centre in Pakistan and the Agriculture Department (Extension & AR) Government of Punjab.

CABI officially launched the PlantwisePlus programme in 2022 to help improve the country's food security through a more coordinated and sustainable approach to food production across the value chain.

The CABI-led programne will help the Pakistan Government and smallholder farmers predict, prepare and prevent plant health threats to help reduce crop losses and increase livelihoods.

PlantwisePlus will seek to help authorities and food producers adapt to the risks posed by climate change – including adverse weather conditions and the potential spread of invasive pests and diseases – while being mindful of the country's growing population expected to reach 338 million in 2050.

Pakistan is one of six PlantwisePlus countries that will effectively serve to 'prove the concept' for the

programme in its delivery of digital innovations. These also include the expansion of its network of plant clinics and plant doctors who help farmers diagnose and remedy their plant health issues.

Particular focus will be on the promotion and use of safer-to-use and more environmentally friendly biological control agents – rather than an over reliance on potentially more harmful chemical pesticides – to protect crops including cotton, rice, maize, wheat and sugarcane.

Dr Babar E.Bajwa, Senior Regional Director, Asia, said, "The signing of the MoU is of strategic importance for the sustainability of the PlantwisePlus programme in Pakisan and is a symbol of the commitment between CABI and the Government of Punjab towards this end.

"PlantwisePlus is building upon CABI's core strengths in invasive species management and knowledge/research dissemination through collaboration with key partners.

"This includes working closely with the Pakistan Agriculture Research Council (PARC), the Department of Plant Protection (DPP), and provincial departments of agriculture and their extension wings.

"Together we are supporting the national system in how to adopt the best practices in plant health – to improve the safety, resilience and quality of crops which, ultimately, will lead to greater food security and livelihoods for smallholder farmers and their families."

Dr Muhammad Anjum Ali, Director of General Agriculture (Extension & AR), said the overarching aim of the programme is to reduce hunger through surveillance and response systems that will help to prevent crop losses due to pests and diseases. "The programme will also help to increase the supply of safe food through a reduction in the use of high-risk practices and facilitate an increase in agri-business-related employment for women and youth," he added.



A ceremony was held in Agriculture House, Lahore, to mark the signing of a Memorandum of Understanding (MoU) between CABI's centre in Pakistan and the Agriculture Department (Extension & AR) Government of Punjab.

He concluded that Punjab provinces are now driving the Plantwise programme with more than 800 plant clinics established and staffed by plant doctors who help smallholder farmers diagnose and remedy their crop health problems.

Dr Ali assured that the PlantwisePlus programme will continue to build upon achievements already enjoyed and build greater capacity in the future as well.

Dr Wasif Khurshid, Secretary of Agriculture, in his closing remarks, said the Government is keen to continue its partnership with CABI through the Plantwise and PlantwisePlus programmes. "The programmes are playing a key role in building the resilience of smallholder farmers to cope with emerging threats to plant health through integrated and dynamic stakeholder engagements and partnerships," he said.

Dr Muhammad Naeem Aslam, CABI's Country Coordinator-PlantwisePlus programme, said it is hoped that this MoU will lead to similar contracts between prominent universities, agricultural research institutions, and with private sector stakeholders who are seeking to build their workforce for agriculture development in the country.

Under the framework of the MoU, CABI is seeking active collaboration for the development of agricultural policy and projects in the country. The aim is to improve and mainstream sustainable agriculture development for poverty alleviation of resource-poor farming communities.

It will strive to do this by identifying key crops where quantity and quality can be improved. Key to this will be the use of digital advisory tools to boost climate-smart plant health practices.

Also important will be the need to increase the supply of and demand for safer, higher quality and locally produced food in domestic markets. Also pertinent is the desire to strengthen detection and response to pest outbreaks, and enhanced availability of safer plant protection products.

Additional information

Main image: Agreement between CABI and the Government of Punjab is signed (Credit: CABI).

About PlantwisePlus

PlantwisePlus is a global programme, led by CABI, to increase incomes and grow safer and higher quality food through sustainable approaches to crop production. Working in close partnership with relevant actors, PlantwisePlus strengthens national plant health systems from within, enabling countries to provide farmers with the knowledge they need to lose less and feed more.

CABI gratefully acknowledges the financial support the Directorate-General for International Cooperation (DGIS), Netherlands; European Commission Directorate General for International Partnerships (INTPA, EU); the Foreign, Commonwealth & Development Office (FCDO), United Kingdom; the Swiss Agency for Development and Cooperation (SDC); the Australian Centre for International Agricultural Research (ACIAR) and the Ministry of Agriculture of the People's Republic of China (MARA).

Meetings and Events

Upcoming meetings and events CABI colleagues will be attending:

- PlantwisePlus National Forum meeting for Pakistan | 23 May | Senior Managers of Provincial Departments and PARC will participate
- **Regional Workshop on ASEAN Bioprotection** | 6-8 June | CABI's team in Malaysia will be attending this event organized by ASEAN FAW Action Plan Secretariat

Recent Publications

Scientific Publications

- Tritrophic interactions among arthropod natural enemies, herbivores and plants considering volatile blends at different scale levels.Cells 12, 251
- Exploration of candidate genes involved in the biosynthesis, regulation and recognition of the male-produced aggregation pheromone of Halyomorpha halys. Insects 14(2), 163
- Performance of two egg parasitoids of brown marmorated stink bug before and after cold storage.Frontiers in Physiology 14
- Current and Potential Future Global Distribution of the Raisin Moth Cadra figulilella (Lepidoptera: Pyralidae) under Two Different Climate Change Scenarios.Biology 12(3), 435
- Lessons Learned and Challenges of Biopesticide Usage for Locust Management—The Case of China.Sustainability 15, 6193
- Two salivary proteins Sm10 and SmC002 from grain aphid Sitobion miscanthi modulate wheat defense and enhance aphid performance.Front. Plant Sci. 14,1104275
- Reproduction system development of Ceracris kiangsu Tsai female adults and its relationship with fitness characteristics. Front. Physiol. 14,1136559
- Daily activity patterns and body temperature of the Oriental migratory locust, Locusta migratoria manilensis (Meyen), in natural habitat.Front. Physiol. 14,1110998

Other recent stories published on the CABI website

- Search for highly effective natural enemy of brown marmorated stink bug wins PhD student Carol Ellison Science Award
- CABI's Executive Council reviews progress and plans to tackle humanity's greatest challenges
- Safer spices improving quality and market access for peppercorn in Vietnam, Lao PDR and Cambodia
- Sowing the seeds of women's leadership in researching Pakistan's chilli sector

Products and Resources

CABI supports study, practice and professional development through our array of publishing products, research services and support tools.

	Product	More information
Core Database and ebooks	CAB Abstracts www.cabdirect.org	https://www.cabi.org/publishing-products/cab-abstracts/
	Global Health www.cabdirect.org	https://www.cabi.org/publishing-products/global-health/
	Global Health Practitioner Interface www.cabdirect.org/globalhealth	https://www.cabi.org/publishing-products/global-health/
	CAB eBooks www.cabi.org/cabebooks	https://www.cabi.org/publishing-products/ebooks/
Internet Resources	AgBiotechNet www.cabi.org/agbiotechnet/	https://www.cabi.org/publishing-products/agbiotechnet/
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	Forest Science https://www.cabi.org/forestscience 	https://www.cabi.org/publishing-products/forest-science- database/
	Horticultural Sciencehttps://www.cabi.org/horticulture	https://www.cabi.org/publishing-products/horticultural- science/
	Leisure Tourism https://www.cabi.org/leisuretourism	https://www.cabi.org/publishing-products/leisure-tourism- database/
	Nutrition and Food Sciences https://www.cabi.org/nutrition 	https://www.cabi.org/publishing-products/nutrition-and- food-sciences-database/
	VetMed Resource www.cabi.org/vetmedresource/	https://www.cabi.org/publishing-products/vetmed- resource/
Compendia	Animal Health and Production Compendium www.cabi.org/ahpc	https://www.cabi.org/publishing-products/animal-health- and-production-compendium/
	Aquaculture Compendium • www.cabi.org/ac	https://www.cabi.org/publishing-products/aquaculture- compendium/
	Crop Protection Compendium www.cabi.org/cpc	https://www.cabi.org/publishing-products/crop-protection- compendium/
	Forestry Compendium ■ www.cabi.org/fc	https://www.cabi.org/publishing-products/forestry- compendium/
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Full Text	CAB Reviews www.cabi.org/cabreviews/	https://www.cabi.org/publishing-products/cab-reviews/
	Distribution Maps of Plant Pests ■ www.cabi.org/dmpp	https://www.cabi.org/publishing-products/distribution- maps-of-plant-pests/
	Distribution Maps of Plant Diseases ■ www.cabi.org/dmpd	https://www.cabi.org/publishing-products/distribution- maps-of-plant-diseases/
	Descriptions of Fungi and Bacteria www.cabi.org/dfb/	https://www.cabi.org/publishing-products/descriptions-of- fungi-and-bacteria/

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CABI is an international intergovernmental organisation, and we gratefully acknowledge the core financial support from our member countries (and lead agencies) including:

