International Association for the
PLANT PROTECTION SCIENCES
IAPPS
NEWSLETTER

Number XI November, 2021

IPM INNOVATION LAB DEVELOPS IPM PACKAGES FOR RICE, LENTIL, AND MAIZE

Virginia Tech's Feed the Future Innovation Lab for Integrated Pest Management has developed three new Integrated Pest Management (IPM) packages. IPM Packages are suites of technologies and resources that farmers can use to identify and manage insect pests, diseases, weeds, and other threats affecting the health of their crops. Since every farmer has different needs, IPM Packages can be adapted wholly or different components can be selected based on farmer conditions. Packages help farmers reduce reliance on chemical pesticides by offering alternatives – such as biopesticides, biocontrol, and other solutions – and are also applicable to the developing country context. The newest IPM Packages developed by the program are for rice, lentil, and maize, but additional IPM Packages for crops including eggplant, onion, tomato, crucifers, peppers, and beans can be found at https://ipmil.cired.vt.edu/publications/packages/

Rice IPM Package: Rice is the most important food crop in the world. It is a staple food across Asia and is becoming important in Africa and Latin America. The traditional method of cultivating rice is flooding the direct-seeded fields with or after transplanting the young seedlings, which is called irrigated rice production. Rice is also grown in the rainfed lowland, in mountains or plateaus, and the deep water. Although rice consumption and demand are increasing around the globe, especially in Asia, stability in rice production in Asia depends on social and political stability. Climate change plays a major role in rice production in Asia. Irrigated rice area provides major production, but it is difficult to increase irrigated rice area due to problems such as soil salinity, high cost of development, water scarcity, alternative and competing uses of water, and environmental concerns of the emission of greenhouse gases. Overall major issues faced in rice production in Asia are variety development, a decline of productivity, declining production resources due to deteriorating soil health, increasing costs of production, post-harvest losses, and abiotic and biotic stresses. Major diseases are Rice blast, Sheath blight, Brown spot, Sheath rot, Seedling blight/Stem rot, Bacterial blight, and Tungro Virus. Major insect pests are Rice mealybug, Stem borers, Rice gall midge, Leafhoppers and Planthoppers, Leaf folders, Case worm, Rice bugs, Rice hispa, and Rice swarming caterpillar. Rice root-knot nematode is also a major problem in Asia.

Lentil IPM Package: Lentil is grown in Africa, Australia, Asia (Indian Subcontinent, Middle East, and West Asia), North America, North Africa, and Southern Europe. Two subspecies of lentil are cultivated in the world: macrosperma and microsperma. Macrosperma is found in the Mediterranean region and the New World (bigger seed size, 6–9 mm in diameter with yellow cotyledons) and microsperma (smaller seed size, 2–6 mm with red-orange cotyledons) is found on the Indian subcontinent and East Africa. Lentil is a major plant protein source that can provide moderate amounts of most essential amino acids and contains fair amounts of minerals, vitamins, and complex carbohydrates. This crop can fix atmospheric nitrogen and can sequester carbon, hence, can improve fertility and nutrient status of soil and further contribute to the sustainability of the agricultural production system. Legumes are a major part of agriculture in Nepal and are grown on about 11% of cultivated land, with lentil covering about 62% area of total legumes. In Nepal, lentil is a winter grain legume and commonly known as 'masoor.' Lentil is grown in agroclimatic zones of Terai, Inner Terai, and the mid-hills in Nepal. The occurrence of diseases and insect pests is a major constraint for lentil production and environmental conditions play an important role. Some diseases and insect pests are persistent and found in wide geographical areas. In Nepal, major diseases of lentil, including fusarium wilt, stemphylium blight, botrytis gray mold, and rust, can cause more than 80% of yield loss. Among insect pests, aphid, cutworm, and pod borer are major problems.

Maize IPM Package: Maize is a staple food in many parts of the world, with the total global production surpassing that of wheat or rice. It is consumed directly and is also used for corn ethanol, animal feed, and other maize products, such as corn starch and corn syrup. There are seven maize groups based on the structure of the grain: flint maize, dent maize, sweet (and super sweet) maize, floury maize, popcorn, waxy maize, and pod corn. In Asia, the maize crop is rotated with other cereal crops such as rice, barley, millet, as well as crops like pulses and oilseeds. In African countries, maize is successfully rotated with sorghum, millet, cassava, cowpea, soybean, potatoes, and other vegetables. Maize is a cold-intolerant crop with a shallow root system. The crop depends on soil moisture and is a more water-efficient crop than others, like soybeans. Maize is most sensitive to drought at the time of silk emergence when the flowers are ready for pollination. The constraints to maize production are biotic and abiotic. The most important abiotic constraints are low soil fertility, drought, and soil erosion. Among biotic constraints, insect pests, diseases and weeds are foremost. These pests are grouped into three categories – field pests, field-to-store pests, and store pests. Different parts of the maize crop (seed, root, foliage, tassel, stem, ear, and grain) are susceptible to different insect pests. The list of major insect pests includes lepidopteran pests (cutworms, armyworms, earworms, borers,), coleopteran pests (wireworms, grubs), and sap-sucking insect pests that serve as vectors (leafhoppers and aphids). Major diseases include leaf/sheath blight, downy mildew, ear/stalk rot, rust, anthracnose, Maize lethal necrosis disease, and *Maize streak virus*. Maize also faces a major problem of weeds in Asia and Africa including several species of grasses, broadleaf plants, and sedges (such as *Cyperus* sp., *Striga* spp.).

Sara Hendery
Communications Coordinator, Feed the Future IPM Innovation Lab
E-mail: saraeh91@vt.edu

BIOLOGICAL ALTERNATIVE TO PESTICIDES DELIVERS ON WHEAT YIELDS

Biological alternatives to chemical pesticides can be used to help deliver comparable wheat yields, according to new ground-breaking research backed by the Yorkshire Agricultural Society.

The use of so-called 'bioprotectants' can reduce the environmental impacts associated with chemicals, and it is hoped that a recent series of trials involving spring and winter wheat varieties could be developed into a viable, widespread solution for growers in the future.

The breakthrough Crop Health North project has been carried out by The Farmer Scientist Network (FSN), a group supported by the Yorkshire Agricultural Society that brings together farmers and scientists to find scientific and technological solutions to agricultural challenges.

Undertaken over three years across field sites at Stockbridge Technology Centre and Newcastle University's Nafferton and Cockle Park Farms, the trials using bio-protectants have been funded through the EU's European Innovation Partnership (EIP-AGRI).

The trials found that wheat can be produced using biocontrol technologies, alone or in combination with conventional crop chemistry, whilst still obtaining similar yields and grain quality.

Nigel Pulling, chief executive of the Yorkshire Agricultural Society, said: "We all know that the world's population is increasing rapidly. This is putting farmers under huge pressure to increase yields whilst protecting the environment for future generations, particularly through the use of fewer chemicals.

"To address this challenge head on, we teamed up with Newcastle University and project partners Stockbridge Technology Centre and BioRationale to look at possible solutions. The results have been very encouraging, and the hope now is that this research can be built upon so that bio-protectants become a real working solution for growers."

Farmers are under mounting pressure to produce high-quality food that consumers demand due to a series of chemical bans that have limited their toolkit to combat diseases and pests at a time of increasingly challenging weather patterns.

James Standen, director of farming at Newcastle University, said: "We are losing active chemical ingredients to protect crops from pests due to the 'precautionary principle' and some crops have now developed a resistance to some chemical treatments, so identifying new opportunities for farmers to help grow profitable wheat crops is really important."

Professor Rob Edwards, chairman of the Farmer Scientist Network, added: "We can't use chemical pesticides in the same way as we have used them in the past. I see this in a similar way to how resistance to anti-biotics is challenging health care systems.

"These trials are all about using biological agents to control fungal disease and insects. Pesticides won't always be the first resource for the future. Farming for the environment, that's exactly what we should be doing, and in terms of sustainability in agriculture, the findings of these trials are massively significant."

Bioprotectant specialist Dr Roma Gwynn, Director of BioRationale, worked closely with farmers and agronomists to design the trials, having collectively identified an urgent need to explore new, innovative crop protection products. Fitting this description well, bioprotectants are crop protection products found in nature or derived from it, and so they degrade easily once applied to crops.

During the trials, bio-protectants were applied to spring (Willow and Mulika) and winter (Skyfall, Leeds and Sundance) wheat varieties. Three treatment programs were used, one using conventional chemical crop protection products, one only using bio-protectants and another involving integrated pest management techniques.

The wheat varieties were chosen due to either their susceptibility to diseases or their various resistance ratings.

Dr David George, reader in precision agronomy at Newcastle University, said: "The project has quite clearly shown that bio-protectants can perform just as well as synthetic crop protection chemistry, especially in integrated programs. The next steps forward are to take the management regimes that have performed very well in our studies to date and try and look at how we can optimize their use."

The project findings will also be shared with the Government, stakeholders and relevant agencies to develop the project further. To find out more, visit www.crophealthnorth.co.uk, or contact **Holly Jones, Network Coordinator, Farmer Scientist Network & Yorkshire Food Farming and Rural Network** HollyJ@yas.co.uk

Dr. Roma Gwynn
IAPPS Biopesticide Industry Representative
Director of BioRationale
E-mail: rgwynn@biorationale.co.uk

The IAPPS Newsletter is published by the International Association for the Plant Protection Sciences and distributed in *Crop Protection* to members and other subscribers. *Crop Protection*, published by Elsevier, is the Official Journal of IAPPS.

IAPPS Mission: to provide a global forum for the purpose of identifying, evaluating, integrating, and promoting plant protection concepts, technologies, and policies that are economically, environmentally, and socially acceptable.

It seeks to provide a global umbrella for the plant protection sciences to facilitate and promote the application of the Integrated Pest Management (IPM) approach to the world's crop and forest ecosystems.

Membership Information: IAPPS has four classes of membership (individual, affiliate, associate, and corporate) which are described in the IAPPS Web Site www.plantprotection.org.

The *IAPPS Newsletter* welcomes news, letters, and other items of interest from individuals and organizations. Address correspondence and information to:

Manuele Tamò
Editor, IAPPS Newsletter
IITA-Benin
08 B.P. 0932 Tri Postal, Cotonou, Republic of Benin
E-mail: m.tamo@cgiar.org