Submissions for Diagnostic Protocols

1. General information

Submission number	2021-014
Title of Proposal	Spodoptera frugiperda
Submitted by	IPPC Contracting Party Kenya

2. Contact information

Name	Prof. Theophilus Mutui
Position and organization	Managing Director
Mailing address	P.O BOX 49592 -00100
Phone	0709891000
Email	director@kephis.org

3. Summary of proposal

Summary of justification for the proposal	The fall armyworm (Spodoptera frugiperda Smith) is a highly polyphagous migratory lepidopteran pest species with a host range of over 80 different plant species in particular on economically important crops including grasses and crops such as maize, soybean, sorghum, rice, wheat and sugarcane. S. frugiperda is native to tropical and subtropical regions of the western hemisphere from the United States to Argentina. In 2016 it was reported for the first time from the African continent, in Nigeria, Sao Tomé, Benin and Togo (IITA, 2016; IPPC, 2016). It was later confirmed in Ghana (CABI, 2017), Zimbabwe (FAO, 2017), Swaziland (IPPC, 2017), Malawi, Mozambique, Namibia, South Africa, Zambia (BBC, 2017) and is present in Kenya. In North and South America where maize is one of the largest commercial crop the S. frugiperda has led to great economic losses. Being a new pest in many countries there is need for a guide on its identification.
Proposed priority	1 (high)
Comments	The pest is currently present in many countries with a potential to spread to new areas.

4. Literature review

Literature review	1.1 Taxonomic Description Kingdom – Animalia Phylum – Arthropoda Class – Insecta Order – Lepidoptera Family – Noctuidae Genus – Spodoptera Species – Spodoptera frugiperda (J.E. Smith) 1.2 Distribution of FAW The Fall Army Worm is native to the tropical regions of the western hemisphere from the United States to Argentina also present in Asia and Africa (Capinera et al 2020) 1.4 Host range This species seemingly displays a very wide host range, with over 80 plants recorded, but clearly prefers grasses. The most frequently consumed plants are field corn and sweet

	corn, sorghum, Bermudagrass, and grass weeds such as crabgrass, Digitaria spp. (Capinera et al 2020, CABI 2020). 1.5 Life cycle of False Codling moth 100-200 eggs are generally laid on the underside of the leaves typically near the base of the plant, close to the junction of the leaf and the stem. These are covered in protective scales rubbed off from the moths abdomen after laying. When populations are high, the eggs may be laid higher up the plants or on nearby vegetation. After hatching, the young caterpillars feed superficially, usually on the undersides of leaves. Feeding results in semitransparent patches, or “windows”, on the leaves. Young caterpillars can spin silken threads which catch the wind and transport the caterpillars to a new plant. Feeding is more active during the night. By stages 4-6, the Fall Army Worm will have reached the protective region of the whorl, where it does the most damage, resulting in ragged holes in the leaves. Feeding on young plants can kill the growing point, resulting in no new leaves or cobs. Often only 1 or 2 caterpillars found in each whorl, as they become cannibalistic when larger and will eat each other to reduce competition for food. After approximately 14 days the fully grown caterpillar will drop to the ground. The caterpillar will then burrow 2-8 cm into the soil before pupating. The loose silk oval shape cocoon is 20-30 mm in length. If the soil is too hard then the caterpillar will cover itself in leaf debris before pupating. After approximately 8-9 days the adult moth emerges to restart the cycle (CABI 2017). 2.0 Morphological identification of Spodoptera frugiperda 2.1 Identification of life stages 2.1.1 Eggs: The egg is dome shaped; the base is flattened and the egg curves upward to a broadly rounded point at the apex. The egg measures about 0.4 mm in diameter and 0.3 mm in height. The number of eggs per mass varies considerably but is often 100 to 200, and total egg production per female averages about 1500 with a maximum of over 2000. The eggs are sometimes deposited in layers, but most eggs are spread over a single layer attached to foliage. The female also deposits a layer of grayish scales between the eggs and over the egg mass, imparting a furry or moldy appearance. 2.1.2 Larva There usually are six instars in fall armyworm. Head capsule widths are about 0.35, 0.45, 0.75, 1.3, 2.0, and 2.6 mm, respectively, for instars 1 to 6. Larvae attain lengths of about 1.7, 3.5, 6.4, 10.0, 17.2, and 34.2 mm, respectively, during these instars. Young larvae are greenish with a black head, the head turning orangish in the second instar. The face of the mature larva is also marked with a white inverted "Y" and the epidermis of the larva is rough or granular in texture when examined closely. 2.1.3 Pupa Pupation normally takes place in the soil, at a depth 2 to 8 cm. The larva constructs a loose cocoon, oval in shape and 20 to 30 mm in length, by tying together particles of soil with silk. If the soil is too hard, larvae may web together leaf debris and other material to form a cocoon on the soil surface. 2.1.4 Adult The moths have a wingspan of 32 to 40 mm. In the male moth, the forewing generally is shaded gray and brown, with triangular white spots at the tip and near the center of the wing. The forewings of females are less distinctly marked, ranging from a uniform grayish brown to a fine mottling of gray and brown.

5. Criteria for prioritization of Diagnostic Protocols

Criteria	Information provided by Submitter
1. Need for international harmonization of the diagnostic techniques for the pest (e.g. due to difficulties in diagnosis	There is need for harmonization of the diagnostic techniques because of the consequences of detection of the pest in trade which may include possible disruption of trade.

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or disputes on methodology)	
2. The relevance of the diagnosis to the protection of plants including measures to limit the impact of the pest.	The protocol will be useful in circumstances such as: – routine diagnosis of Spodoptera frugiperda. – routine diagnosis Spodoptera frugiperda in imported consignments – general surveillance for Spodoptera frugiperda status – surveillance as part of an official control or eradication programme – testing of material for compliance with certification schemes – Spodoptera frugiperda diagnostic associated with phytosanitary certification – detection of Spodoptera frugiperda in an area where it is not known to occur – detection of Spodoptera frugiperda in a consignment originating in a country where the pest is declared to be absent.
3. Importance of the plants protected on the global level (e.g. relevant to many countries or of major importance to a few countries).	The pest is relevant to many countries and will increasingly be relevant to others.
4. Volume / importance of trade of the commodity that is subjected to the diagnostic procedures (e.g. relevant to many countries or of major importance to a few countries).	Ffield corn and sweet corn, sorghum, Bermudagrass, and grass weeds such as crabgrass, Digitaria spp. are a host to the pest. These products have great significance to food security and trade in many countries.
5. Other criteria for topics as determined by CPM that are relevant to determining priorities	Kenya has started to develop a protocol for identification of the pest. The protocol has the potential to contribute to the early detection and prevention of spread of the pest and hence have great economic impact.
6. Th balance between pests of importance in different climatic zones (temperate, tropics etc) and commodity classes.	The pest is of importance in different climatic zones. Many countries instituted emergency measures for the prevention of introduction of the pest.
7. Number of labs undertaking the diagnosis.	Information immediately not available.
8. Feasibility of production of a protocol, including availability of knowledge and expertise.	There is relevant expertise in North and South America and Africa.