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USING GPS/GIS TO IDENTIFY AND MANAGE INSECTS/NEMATODES IN SOIL EC ZONES AND AT FIELD MARGINS

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Abstract

The integrity, accuracy, and availability of GPS have improved precision applications in agriculture and provide us with new tools to evaluate insect/nematode problems in production fields. Significant electrical conductivity (EC) correlations to soil particle size make it easy to develop zones within fields that represent soil changes. The zones can likewise be analyzed for effects on insects. Edge effects and early detection of insect movement into fields may be aided by use of grids.

For the purpose of this project, bulk soil electrical conductivity data was collected utilizing a Veris ® 3100 soil (EC) mapping System. The Veris sensors consist of six coulters, two of which introduce an electrical potential into the soil. The remaining four coulters are spaced to measure EC over two approximate depths, 0-1' and 0-3‘. The soil electrical conductivity data derived from the Veris 3100 for the project fields were analyzed utilizing SSToolbox. The EC measurements provided accurate maps and identified the soil zones that varied in texture.

Selected GPS/GIS tools were used in data collection including LSU AgCenter Multi-spectral analysis systems, SSToolbox, ArcView, Farm Works, Dell Latitude laptop computers, Compaq and Dell hand held computers equipped for GPS data management, LSU Atlas DOQQ image files, Omni Star, and ARM 7 software.

A preliminary soil sample was collected from each site to determine nematode density and species composition using standard sampling procedures. Fields were selected that have either root-knot or reniform nematode present. The field was outlined using GPS and grided into 1-acre blocks with a flag placed in the center of each grid. Soil sampling probes which are 19” in length and ¾” in diameter were used to collect soil. Quart-sized, freezer bags were used to store soil for nematode analysis. The influence of soil EC on densities of aphids and thrips was determined by randomly selecting 5 plants per plot on 11 June 2003. Samples were collected according to the 1 acre grid used for nematode collections. Plant samples were processed by using whole plant washing procedures to remove insects. Tarnished plant bug injury within an 82 acre cotton field was estimated by examining all white flowers within 200 ft of row for evidence of tarnished plant bug feeding. A one acre grid pattern was overlaid onto a DOQQ image of the field, and white flowers were examined near the center point of each grid block between the hours of 10:00 am and 1:00 pm on 15 July 2003.

The Veris EC data indicated that injury caused by the root-knot nematode and Fusarium wilt complex was associated with areas of low EC. Affected areas within the field were easily identifiable on multispectral images. Aphid densities declined as soil EC increased from low to intermediate levels after which aphid densities increased as soil EC increased from intermediate to high levels. Thrips densities demonstrated no relationship with soil EC level. Geospatial examination of tarnished plant bug damage indicated that injury was generally confined to the field margin. This pattern of damage may have been influenced by the type of vegetation adjacent to the cotton field, including grain sorghum, field corn, and areas of native vegetation.

These studies represent only one year of research and will be continued. The interim results suggest the described techniques may be useful in providing enhanced monitoring of pests within fields and at field margins.