Development of a Novel AI Soybean Root-Knot Nematode Stress Assessment (NASRKNSA) Model in Soybean Plants (Both Field and Home-Grown)

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Southern Root-Knot Nematodes (Meloidogyne incognita) are microscopic roundworms that act as parasites, causing devastating damage to crops worldwide. These parasites primarily target the roots of soybeans and other plants, especially in most soybean-producing counties in Arkansas with possible grain yield losses as significant as greater than 75\% with a high population of Southern Root-Knot Nematodes (SRKN). The variety of soybean, Conventional Soybeans, were planted in potting pots, to minimize nematode damage, with and without the nematodes, and photographed throughout the growing season to see the effects of the infection. Infected and non-infected soybean plant data were collected from both field and home-grown plants, ensuring proper identification with similar growing conditions. The data, consisting of pictures taken every few days, was processed in Google Colaboratory and placed into a student-built Convolutional Neural Network to see if a computer could recognize and classify soybean plants infected with SRKN from those without the disease. It was hypothesized that a NASRKNSA model could quickly and more accurately detect early signs of nematode infection in soybean plants than the current detection process with photographic data of infected and non-infected soybean plants. The NASRKNSA model was able to achieve an average mean score above 50\%, showing that infected plants are able to be identified, not far from real-time. This study showed that the NASRKNSA model has potential to detect soybean plants infected with Root-Knot Nematodes more efficiently, indicating that the usage of this model in real-time could help soybean farmers potentially avoid major crop losses earlier on.

Awards Won:

Third Award of $1,000