

Georgia Agricultural Commodity Commission for Tobacco
University of Georgia Tifton 31793, GA
2025 proposal

(Continuation and Extension).

- **Title:** “Development of genomic tools to manage the spotted wilt disease and molecular diversity of TSWV on tobacco in Georgia.”
- **Investigator Name:**
 - ❖ Sudeep Bag, Assistant Professor-Crop virology, Department of Plant Pathology, UGA-Tifton, GA
 - ❖ J. Michael Moore, Extension Agronomist-Tobacco, UGA-Tifton, GA
 - ❖ Saritha R.K. Senior Research Associate, Department of Plant Pathology, UGA-Tifton GA

• **Continual Project:**

Need for research in Georgia: Although tobacco production has decreased significantly in the US since the 1980s, the US continues to be the leading producer of high-quality tobacco globally. Spotted wilt, caused by thrips-transmitted tomato spotted wilt orthotospovirus (TSWV), has been a significant constrain to agricultural production and quality yield in ornamentals, peanuts, tobacco, and vegetables. Due to lack of host resistance, the disease management relay solely on insecticide application along with cultural practices and integrative pest management (IPM) strategies. Even with the implementation of the tools available, in the summer of 2022 the spotted wilt disease incidence has been significantly increases causing significant yield and economic loss. With the advancement of genomic tools, an attempt was made to develop a separable biological molecule that can be utilized as “plant vaccine” against TSWV and induce resistance on tobacco. Preliminary results suggest that the vaccine can induce the plant's defense response in tobacco (Konakalla et al., 2021). Further, research is ongoing for curative or preventive mechanisms of the sprayable plant vaccine targeting different viral genes (N and NSs).



Figure 1: Different symptoms as vein necrosis, chlorosis and localized necrotic spots observed on tobacco at the Ponder farm-UGA Tifton. A) Field view with 20-30% of disease incidence B) plant with severe symptoms with no harvestable yield (C) Bottom leaf showing vein necrosis that are systemic in upper leaves (D) local necrotic spots on lower leaves while vein clearing in upper leaves.

Secondly, as early as 2002, two different biological isolates of TSWV were reported based on the symptoms produced on various crops (Mandal et al., 2006). Over several cropping seasons, different types of symptoms were observed on tobacco plants. **The development of symptoms is influenced** by the time of infection, the age of plants, or other physiological and **genomic factors**. But there is no definitive report based on this differential symptomatology. Lai et al., (2021) suggested that there is no difference in strains of TSWV based on the conserved genomic regions. **RNA viruses are known to be evolved by mutation to suppress the host resistance**. Approximately, 350 plant leaf tissues were collected from three different counties expressing various level of disease incidence. These samples will be used for a detailed study on the evolution of the virus in the region, resulting in the project's initiation to build a biological and genomic library for TSWV isolates from the region. The present study will be conducted to investigate the following objectives.

- **Objectives:**

- ❖ To develop a biological spray “Spray induced gene silencing” against TSWV in tobacco.
- ❖ To determine the potential genetic variation in TSWV. **(This objective is complete, and we are compiling data)**

- **Potential benefit/impact:**

- ❖ Developing advanced genomic tools to manage the spotted wilt disease.
- ❖ Investigation of the existence of any biological strains present in tobacco.
- ❖ Establishment of the biological and genomic library at the UGA-Tifton to study the evolution of the virus in the region.

- **Procedures and location(s) of research:**

- ❖ “Plant vaccine” will be tested for its efficacy and application with nanoparticle
- ❖ The samples have been collected from since 2018 and an attempt will be made to generate full-length sequencing of TSWV isolates collected from tobacco using the Next-Generation and Sanger sequencing. **(The graduate student is compiling data)**

- **Location:**

- ❖ The molecular analysis of the isolates will be done at the plant virology Laboratory, Department of Plant Pathology, UGA-Tifton campus
- ❖ Maintenance of Biological isolated at the greenhouse facility at the UGA-Tifton campus

- **Budget:**

Activities	Cost \$
Consumables for molecular diagnosis and reagents, NGS sequencing	10,000
Travel	2,000
Total	12,000

Justification: Funds (\$12,000) are requested to support research for NGS sequencing, molecular biology reagents. Funds (\$2000) are requested to support travel to APS meeting in 2025, to share the results from objective one.

Efficacy and Practicality of Non-Fumigant Nematicides as a Root-Knot Nematode Management Solution in Georgia Tobacco Fields, 2025

SUBMITTED BY:

Intiaz Amin Chowdhury

Assistant Professor Cotton and Vegetable Crop Nematology

2360 Rainwater Road, Tifton, GA 31793

J. Michael Moore

Extension Agronomist - Tobacco

2360 Rainwater Road, Tifton, GA 31793

OBJECTIVES:

1. Evaluate the efficacy of non-fumigant nematicides in controlling root-knot nematodes infesting tobacco fields in Georgia.
2. Determine whether non-fumigant nematicides are a practical solution, as fumigant nematicide replacements, in tobacco fields with low root-knot infestation levels.

JUSTIFICATION

Plant-parasitic nematodes are microscopic roundworms that are responsible for annual agricultural losses worth more than \$125 billion world-wide. It is estimated that nematode damage can cause tobacco yield losses as high as 500-600 pounds per acre resulting in economic losses worth \$1,000 per acre. When it comes to their management, fumigant nematicides are commonly used in tobacco fields to reduce yield losses. Fumigants such as methyl bromide and 1,3-dichloropropene (Telone II) are highly effective in managing nematode populations. However, their use comes with significant challenges. Methyl bromide was phased out of agricultural applications due to its severe environmental impacts. While Telone II remains widely used for agricultural crop protection, including tobacco, it is highly expensive. Moreover, regular concerns about supply shortages further complicates its reliability as an available management solution for growers. Non-fumigant nematicides, on the other hand, can be relatively less expensive with lower toxicity profile to non-target organisms. Fluorinated nematicides such as Fluopyram (Velum Prime) and Fluensulfone (Nimitz) have been shown to be efficacious in controlling root-knot nematode populations in previous studies. However, several studies have reported these nematicides to have comparatively lower efficacy than fumigants for nematode control.

A 2023-2024 survey of tobacco fields in Georgia revealed significant variation in root-knot nematode population densities across the state. While many of the fields were heavily infested, several had relatively low nematode densities. However, Telone II is commonly used in a majority of Georgia tobacco fields for nematode management. We hypothesize that non-fumigant nematicides can be a more economically practical solution for root-knot nematode management in fields with low infestation levels. Alternating the use of non-fumigant nematicides with fumigants across seasons has the potential to significantly reduce grower costs. Hence, we propose to conduct four on farm trials across four locations in Georgia, with different fumigant and non-fumigant nematicide application regimes. These trials will assess the

practicality of using non-fumigant nematicides in Georgia tobacco fields based on nematode population densities.

IMPLEMENTATION

To achieve the objectives of this study, four trial locations will be selected based on root-knot nematode population densities, as determined by the recent tobacco field survey. Two fields will represent higher infestation levels, while the other two will be selected based on their lower infestation levels. Each trial will evaluate the following treatments: (i) untreated control, (ii) Telone II applied at 6 gallons per acre, (iii) Velum Prime applied at 6.84 ounces per acre, and (iv) a combination of Nimitz at 7 pints per acre and Velum Prime at 6.84 ounces per acre. The trials will be conducted in five replicates in a randomized complete block design. Root-knot nematode population densities in each plot will be assessed prior to planting or nematicide application, mid-season, and at harvest. Soil sampling for nematode density determination will involve collecting soil from 10 locations within each plot, which will be combined into a single composite sample per plot. Nematodes will then be extracted from the soil using sieving and decanting methods and enumerated under a microscope based on their morphological characteristics. Plant vigor will be evaluated periodically throughout the growing season on a 0–10 scale, with 0 representing a dead plant and 10 representing a healthy plant. Galling severity will be assessed on 10 randomly selected plants per plot after the final harvest, using a 0–10 scale where 0 indicates no galls and 10 indicates a completely galled plant. Yield will be assessed for each plot.

BUDGET:

The Georgia Commodity Commission for Tobacco (GACCT) is requested to fund **\$8,000** for this project.

Proposed budget from GACCT for Dr. Chowdhury's team:

Category	Amount	Notes/ Explanation
Salary	\$6,500	We request \$6,000 to fund the hourly wages of a part-time student worker, who will help in extracting nematodes from soil
Materials and Supplies	\$500	Funds for supplies including nematode extraction materials, sieves, microscope slides, sugar, nematode suspension vials etc.
Breakdown Total	\$7,000	

Proposed budget from GACCT for Dr. Moore's team:

Category	Amount	Notes/ Explanation
Materials and Supplies	\$1,000	Ziploc bags, coolers for transporting samples, sample probes and markers.
Breakdown Total	\$1,000	
Project Total	\$8,000	



THE UNIVERSITY OF GEORGIA

COOPERATIVE EXTENSION

Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

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PROPOSALS-----EDUCATION PROJECTS

FUNDED BY GEORGIA TOBACCO COMMISSION FOR FISCAL YEAR 2024-2025

2024-2025 GACCT BUDGET – PROPOSED FOR APPROVAL, DECEMBER, 2024

UNIVERSITY OF GEORGIA COOPERATIVE EXTENSION - TIFTON, GA

DR. J. MICHAEL MOORE - PROFESSOR & EXTENSION AGRONOMIST -
TOBACCO

EDUCATION:

University of Georgia Cooperative Extension
(\$19,000.00)

Amount Proposed

- | | | |
|----|---|---------------------|
| 1. | <u>Printing Extension Tobacco Publications and</u>
<u>Printing and Lamination of Educational Posters</u> | \$ <u>1,000.00</u> |
| 2. | <u>Support of Extension Tobacco Team Program Efforts</u> | \$ <u>18,000.00</u> |
| 3. | <u>Support for Recognition for Winners in the 2025 Tobacco</u>
<u>Improvement Program (TIP)</u> | \$ <u>1,000.00</u> |

TOTAL EDUCATION

\$ 19,000.00

Learning for Life

Agriculture and Natural Resources * Family and Consumer Sciences * 4-H Youth
An Equal Opportunity /Affirmative Action Institution

**Proposal to
The Georgia Agricultural Commodity Commission for Tobacco, 2025
December, 2024**

TITLE: Funding for **Printing Extension Tobacco Publications and Printing and Lamination of Educational Posters.**

SUBMITTED BY: J. Michael Moore, Extension Agronomist - Tobacco

COOPERATORS: J. Michael Moore

OBJECTIVE: To provide funding for printing of Extension tobacco publications and posters to include; sections of the Georgia Tobacco Grower's Guide and other incidental tobacco related publications and posters (to include lamination). To provide information resulting from projects conducted in Georgia during the production season to county agents, tobacco and chemical industry personnel and research and extension personnel in other states.

JUSTIFICATION: The Georgia Tobacco Grower's Guide is compiled by the Georgia Extension Tobacco Team and printed for distribution to the tobacco growers of the state with assistance from the Georgia Tobacco Commission.

Occasionally, other smaller publications are required to be compiled and printed with short notice and without specific funding. Examples have included: "Georgia Tobacco Tour Program" and various educational posters for county agents and state faculty. Posters have become a popular means of presenting educational information and Georgia Agents have developed a national reputation for the quality of their posters.

REQUEST FOR FUNDING: The Georgia Commodity Commission for Tobacco is requested to fund the printing of Extension tobacco publications not to exceed **\$1,000**.

**Proposal to
The Georgia Agricultural Commodity Commission for Tobacco, 2025
December, 2024**

TITLE: Funding in Support of Extension Tobacco Team Program Efforts

SUBMITTED BY: J. Michael Moore, Extension Agronomist - Tobacco

COOPERATORS: J. Michael Moore, Extension Crop and Soil Sciences

- OBJECTIVES:**
1. Conduct On-Farm Demonstrations relating to tobacco production, pest management, harvesting and curing, residue management and quality improvement which will provide examples and information useful to the tobacco producers of Georgia and which may assist them in improving the quality and quantity of tobacco produced.
 2. Prepare On-Farm Demonstrations with small plot signs and field markers for presentation on the Georgia Tobacco Tour.
 3. Purchase of tobacco seedlings and supplies for on-farm demonstrations to include; black shank variety trials, released variety demonstrations and other on-farm demonstrations from centralized producers.
 4. Travel and vehicle maintenance to manage demonstrations and to participate in state and regional meetings to represent the interests of Georgia tobacco producers inside and outside the state of Georgia.
 5. Maintain (re-calibrate meters, purchase and replace probes) and manage the availability of CO₂ meters for use by growers to check for leaking curing barn heat exchangers.

JUSTIFICATION: The Georgia Extension Tobacco Team has developed a reputation for conducting On-Farm Demonstrations throughout the production area which are useful in generating information for immediate use and for demonstrating proper use of new and developing practices and materials. As university travel budgets are reduced and chemical companies and tobacco companies merge and consolidate funding for visiting and managing these plots has been reduced and additional funding is needed.

IMPLEMENTATION: Extension Tobacco Team Members will benefit from the availability of funds to facilitate the conduct and maintenance of the Tobacco Extension Program. The University of Georgia, the Georgia Tobacco Commission and the tobacco growers of Georgia will benefit from the conduct of quality demonstrations and tours and from travel to represent grower interests inside and outside the state.

REQUEST FOR FUNDING: The Georgia Commodity Commission for Tobacco is requested to fund up to **\$17,000** for this project.

Proposed Budget from GACCT for 2023:

Operating, supplies	8,500.00
Travel	8,500.00
Total	\$17,000.00

**Proposal to
The Georgia Agricultural Commodity Commission for Tobacco, 2025
December, 2024**

TITLE: Funding of the
2025 Georgia Tobacco Improvement Program

SUBMITTED BY: J. Michael Moore, Extension Agronomist - Tobacco

OBJECTIVE: To provide incentive and recognition for county agents conducting tobacco related educational projects. Written reports will explain the planning, implementation and evaluation of projects and their contribution to the improvement of tobacco production in the county conducted.

JUSTIFICATION: County agents are supportive of this program. Participation in the program is a significant educational experience for the agent and the information generated is of benefit to the local growers as well as all growers in the state.

REQUEST FOR FUNDING: The Georgia Commodity Commission for Tobacco is requested to fund the cost of this program for the **2025** season. Funding is requested at **\$1,000** to provide financial awards and plaques to participating county agents. Approval is required now in order to conduct this program in the fall of 2025.