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ARTICLE

Effects of Peanut Cultivar and At-Plant Insecticides on Thrips Injury, Tomato Spotted Wilt Virus, and Yield in Nematode-Infested Fields

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ABSTRACT

Tobacco thrips (*Frankliniella fusca*) are a key early-season pest of peanut and transmit tomato spotted wilt virus (TSWV), both of which can reduce yield when not managed effectively. This study evaluated the effects of peanut cultivar and at-plant insecticide on thrips injury, TSWV incidence, canopy development, nematode (*Meloidogyne arenaria*) infestation and yield in Alabama from 2023 to 2025. Two cultivars (GA-06G and GA-12Y) were planted with four treatments: a non-treated control and at-plant applications of aldicarb (7.8 kg/ha), phorate (5.6 kg/ha), and oxamyl (1.3 L/ha). Thrips injury (0-5), seedling vigor (0-100), fractional green canopy cover, TSWV incidence and nematode population estimates were done at various timings through 56 days after planting (DAP) and yield was collected at the end of the season. At-plant insecticides reduced thrips injury compared to the non-treated control. Seedling vigor was greatest in Georgia-12Y peanuts and where AgLogic was applied. TSWV was greater and fractional green canopy cover was lower in non-treated plots and where GA-06G was used. Peanut root knot nematode egg counts did not differ among treatments. Yield was greater in GA-06G overall and where at-plant insecticides were applied. These results demonstrate that at-plant insecticides contribute to thrips and TSWV suppression and protect yield in Alabama peanut production.

INTRODUCTION

Peanut (*Arachis hypogaea* L.) became a major money crop planted in rotation with cotton, especially when the boll weevil was a widespread concern across the cotton belt (Beattie, 1920). Today, peanut ranks 7th in Alabama's agricultural commodity crops (USDA NASS, 2022). Nationally, Alabama ranks 2nd in peanut production, with 255.8 million kilograms (3,363 kg/ha) of peanuts produced in 2024 (USDA NASS, 2025). Peanuts are a major contribution both nationally and locally to the economy, with a farm value of $1 billion across the U.S. (National Peanut Board, 2026).

Thrips (*Thysanoptera*: *Thripidae*) are a common pest in multiple crops across the Southeastern U.S., vectoring several Tospovirus diseases. Specifically in peanuts, tobacco thrips (*Frankliniella fusca* Hinds) vector the tomato spotted wilt virus (TSWV). Both larvae and adult thrips can transmit the virus when feeding directly on the plant, causing leaf chlorosis, curling, and yield loss (LaTora *et al.* 2022), especially when thrips populations are high early in the growing season (Srinivasan *et al.* 2018). Thrips damage appears as "silvering" on the leaves, which is a result of empty epidermal cells in leaves fed upon by thrips (Srinivasan *et al.* 2018). Tomato spotted wilt virus induces several symptoms on infected peanut plants, including concentric ring spots, chlorotic patterns, general stunting on plants, and also misshaped pegs and kernels

(Srinivasan *et al.* 2017). Earlier expression of TSWV symptoms has been associated with greater yield loss compared with symptom expression later in the growing season (Culbreath *et al.* 1992, Garcia *et al.* 2000). Studies show that there is a correlation between thrips populations and TSWV incidence (Garcia *et al.* 2000, Shrestha *et al.* 2015). Research from the University of Georgia shows that for every 1% TSWV incidence in the Georgia-06G (GA-06G) variety, yield is reduced by ~22 kg per hectare (Abney, 2022).

Several management strategies, including both chemical and cultural practices, can reduce thrips injury and potentially TSWV incidence. Using pre-plant in-furrow insecticides, such as imidacloprid, phorate, and aldicarb are shown to effectively suppress thrips (Marasigan *et al.* 2015). However, insecticide suppression of thrips does not necessarily result in reduced TSWV incidence, and the effectiveness of chemical control may be influenced by insecticide resistance and application timing. Reduced susceptibility to neonicotinoids, including imidacloprid, has been documented in the southeastern United States (Huseth *et al.* 2016), potentially limiting the reliability of these products for thrips management. Marasigan *et al.* 2015 found that the use of alternative insecticides, including foliar applications of thiamethoxam, spinetoram and cyantraniliprole, were effective at reducing thrips feeding regardless of variety, but injury in plots treated with these alternative insecticides was no different than that of the non-treated plots. Studies show planting date reduces thrips incidence and TSWV severity (Mahoney *et al.* 2018, Cooke *et al.* 2025). Mahoney *et al.* (2018) observed peanuts planted late had less thrips injury. Cooke *et al.* (2025) found similar results, with greater thrips injury and TSWV incidence in early planted peanuts compared to late planted peanuts. Variety selection is another important cultural factor in managing TSWV. According to Wright *et al.* (2016), varieties differ in their resistance to diseases. Branch *et al.* (2003) noted that TSWV-resistant, runner-type peanut cultivars are the most important defense to control spotted wilt disease. Along with variety selection, Wright *et al.* (2016) also noted that higher seeding rates reduce TSWV incidence. Though thrips pressure can have a substantial impact on yield, other pests such as nematodes can also impact peanut production.

Nematodes are significant pests of peanuts in the southeast. Several *Meloidogyne* species are associated with peanut, with *Meloidogyne arenaria* (peanut root-knot nematode) being the predominate and most damaging species in Alabama (Minton and Baujard 1990, Dickson and De Waele 2005, Hagan *et al.* 2025). Yield losses from *M. arenaria* can exceed 50% in highly infested fields (Minton and Baujard, 1990). *Meloidogyne arenaria* juveniles infest peanut roots, pegs and pods, inducing giant cells and root galls that impair water and nutrient uptake (Jones 1981, Dickson and De Waele 2005). Above ground symptoms include stunting and premature plant death, while infected pegs may break during harvest and infected pods can reduce yield and quality (Starr and Morgan 2002). Management of *M. arenaria* relies primarily on crop rotation, resistant cultivars and nematicides (Grabau *et al.* 2020, Hagan *et al.* 2025). Resistant cultivars can provide a less costly alternative to nematicides and greater flexibility than crop rotation (Grabau *et al.* 2025). Nematicides can also increase yields under high nematode pressure (Grabau 2020). The objective of this study was to evaluate the effects of variety and insecticide treatment on thrips management in fields infested with *M. arenaria*.

METHODS AND MATERIALS

Experimental Design

Experiments were conducted at the Wiregrass Research and Extension Center in Headland, AL from 2023 to 2025 to evaluate the management of tobacco thrips and the transmission of tomato spotted wilt virus. Two peanut varieties, GA-06G and GA-12Y (Georgia-12Y), were planted in late April at a seeding rate of 20 seed per m on 0.9 m rows in four row plots 9.1 m long with four replications. Treatments consisted of a non-treated control and in-furrow applications of 7.8 kg/ha of aldicarb (AgLogic, AgLogic Chemical, Chapel Hill, NC), 5.6 kg/ha of phorate (Thimet, AMVAC Chemical corporation, Newport Beach, CA), and 1.3 l/ha of oxamyl (Vydate, Corteva Agriscience, Indianapolis, IN).

Data Collection

Stand counts were made 15 days after planting (DAP) by counting the number of plants in the center two rows of each plot. Whole plot seedling vigor and thrips injury ratings were made at 15, 22, and 29 DAP. Vigor was rated on a 0-100 scale where 0 is no vigor and 100 is maximum vigor. Thrips injury was rated on a 0-5 scale as described by Cooke *et al.* (2025). Percent TSWV incidence was estimated by determining the number of row meters that showed symptoms of TSWV, such as stunted growth, leaf chlorosis or ringspots, divided by the total number of row meters in the middle two rows of each plot at 50 and 56 DAP. Fractional green canopy cover (FGCC) was also obtained at 50 and 56 DAP using the Canopeo application on iPhone following the methods described in Cooke *et al.* 2025.

Additionally, *Meloidogyne arenaria* were collected. Four random, representative plants from each plot were dug up to collect plant and nematode data. Plant parameters included plant height, shoot and root fresh weight. These data were collected between 30 and 45 DAP across years. After collecting plant parameters, peanut roots were used to obtain nematode population levels. A modified method of Hussey and Barker (1973) was used to extract the root-knot nematode eggs in this study. Roots were weighed and then placed in a 0.625% NaOCl solution and shaken for four minutes on a Barnstead Lab Line Max Q 5000 E Class shaker (Conquer Scientific, San Diego, CA). Roots were then washed with water and rubbed by hand. Eggs were rinsed with tap water, collected on a sieve (25-µ) and poured into a 50mL centrifuge tube, and processed by a modified sucrose centrifugation-flotation at 240 *g* for 1 minute (Jenkins 1964). The supernatant was collected on a 25-µ sieve, rinsed with water. Eggs were enumerated using a Nikon TSX 100 inverted microscope at 40x magnification. Peanuts were machine harvested on September 19, 2023, October 2, 2024 and September 19, 2025.

Data were subjected to analysis of variance (ANOVA) using PROC GLIMMIX in SAS 9.4 (SAS Institute; Cary, NC). Cultivar, at-plant insecticide and their interaction were included as fixed effects, while year, replication and year nested within replication were included as random effects. Data were

analyzed across years. For variables evaluated on multiple rating dates, observations were averaged across dates to evaluate the overall effect of each treatment across the sampling period. Model assumptions were evaluated using residual diagnostics. TSWV incidence was square-root transformed prior to analysis to meet model assumptions; all other response variables were analyzed on the original scale. Means were presented on the original scale for ease of interpretation. When significant effects were detected, means were separated using Fisher's protected Least Significant Difference (LSD) at α=0.05.

RESULTS

Seedling Health

Stand counts did not differ significantly between variety (F = 0.15; df = 1, 76; p = 0.7040) or treatment (F = 0.48; df = 3, 76; p = 0.6976), and there was no significant interaction between the factors (F = 1.01; df = 3, 76; p = 0.3934). For seedling vigor, there was a significant difference between variety (F = 6.95; df = 1, 48; p = 0.0113) and treatment (F = 11.24; df = 3, 48; p <0.0001), but there was no significant interaction between factors (F = 0.70; df = 3, 48; p = 0.5585). Vigor was significantly greater in Georgia-12Y (88.2±0.7) compared to Georgia-06G (86.8±0.5). Peanuts treated with AgLogic (89.0±0.9) and Vydate (88.3±0.9) had significantly greater vigor than peanuts treated with Thimet (87.2±1.0). Non-treated peanuts had significantly less vigor (85.4±0.6) than all other treatments (Table 1).

Table 1. Effects of peanut cultivar and at-plant insecticide treatment on average (Mean ± SEM) stand, thrips injury, tomato spotted wilt virus (TSWV) incidence, plant vigor, fractional green canopy cover, root-knot nematode eggs per gram of root, and yield in Headland, AL, 2023-2025.

Effect	Stand [z]	Thrips Injury	% TSWV Incidence	Vigor	% Fractional Green Canopy Cover	Nematode eggs/g root	Yield (kg/ha)
Cultivar							
Georgia-06G	76.2 a (3.7)	1.56 a (0.07)	2.50 a (0.33)	86.8 b (0.5)	40.2 b (4.3)	32.8 a (30.08)	5265.0 a (178.0)
Georgia-12Y	77.9 a (4.2)	1.41 a (0.08)	1.28 b (0.21)	88.2 a (0.7)	51.9 a (3.9)	66.4 a (30.08)	4887.7 b (157.1)
At-plant insecticide							
Check	77.1 a (5.0)	1.88 a (0.11)	2.87 a (0.58)	85.4 c (0.6)	40.1 b (5.1)	106.3 a (34.94)	4702.7 b (237.5)
Thimet	75.3 a (6.4)	1.42 b (0.08)	1.96 a (0.34)	87.2 b (1.0)	56.6 a (6.5)	43.4 a (34.94)	5013.5 ab (266.9)
Vydate	78.2 a (5.4)	1.42 b (0.10)	1.54 a (0.36)	88.3 ab (0.9)	44.9 a (5.7)	24.6 a (34.94)	5210.7 a (222.3)
AgLogic	77.8 a (6.0)	1.23 b (0.11)	1.30 a (0.24)	89.0 a (0.9)	44.4 a (6.3)	24.1 a (34.94)	5376.0 a (225.4)

[z] Means within the column that are followed by the same letter are not different according to Fisher's Protected LSD (α = 0.05).

Thrips

There was a significant difference in thrips injury between treatments (F = 9.71; df = 3, 76; p < 0.0001) but not between variety (F = 3.18; df = 1, 76; p = 0.0785), and there was no significant interaction between the factors (F = 0.24; df = 3, 76; p = 0.8673. The non-treated peanuts had significantly greater thrips injury (1.9±0.1) than all other treatments (Table 1).

Tomato Spotted Wilt Virus

There was a significant difference in percent of TSWV incidence between variety (F = 15.01; df = 1, 73; p = 0.0002) but not for treatment (F = 2.55; df = 3, 73 p = 0.0524) or the interaction between these factors (F = 0.33; df = 3, 73; p = 0.8064). Georgia-06G peanuts had significantly higher percent of TSWV incidence (2.5±0.3) compared to the Georgia-12Y peanuts (1.3±0.2). The non-treated peanuts had significantly greater percent of virus (2.87±0.6) than all other treatments (Table 1).

Canopy Data

There was a significant difference in canopy ratings between variety (F = 21.20; df = 1, 41; p <0.0001) and treatment (F =

4.03; df = 3, 41; p = 0.0134), but there was no significant interaction between factors (F = 1.44; df = 3, 41; p = 0.2457).

Nematode Data

No differences in root knot nematode eggs per gram of root were observed for variety (F = 1.78; df = 1, 52; p = 0.1881), treatment (F = 2.39; df = 3, 52; p = 0.0791), and there was no interaction between factors (F = 0.66; df = 3, 52; p = 0.5824).

Yield

There was a significant difference in yield between variety (F = 7.84; df = 1, 63; p = 0.0008) and treatment (F = 6.33; df = 3, 63; p = 0.0068), but there was no significant interaction between factors (F = 0.54; df = 3, 63; p = 0.6545). Yield was significantly greater in GA-06G peanuts (5265.0±178.0 kg/ha) compared to the GA-12Y peanuts (4887.7±157.1 kg/ha). Yield was significantly lower in the non-treated check (4702.7±237.5 kg/ha) than all other treatments (Table 1).

DISCUSSION

Overall, peanuts that were treated with an at-plant insecticide were healthier, with less thrips injury and virus, ultimately producing greater yields than untreated peanuts. Both cultivar and at-plant insecticide affected yield, with GA-06G producing greater yield than GA-12Y and insecticide treated peanuts producing greater yield than non-treated peanuts. In our trials, plant populations were similar across treatments and varieties. Zurweller *et al.* (2023) found that planting date and variety had an impact on plant population, while insecticide treatment did not affect plant stand. Our data also indicated that non-treated peanuts had less vigor than those treated with an at-plant insecticide. However, because insecticide treatments also reduced thrips injury, the observed differences in vigor cannot be separated from the effects of thrips feeding and injury. Thus, these results should be interpreted as an overall plant response to at-plant insecticide protection rather than evidence that insecticide directly impacted plant health. Similar increases in plant vigor with at-plant insecticides have been reported by Moor *et al.* (2021).

Previous research documented a clear relationship between thrips abundance and TSWV incidence (Garcia *et al.* 2000, Shrestha *et al.* 2015). Although we did not directly quantify thrips populations, thrips injury ratings provide a reliable indicator of feeding activity, which is the mechanism by which TSWV is spread. We observed this correlation in our study, where non-treated peanuts had greater thrips injury (thus higher thrips activity) and correspondingly higher incidence of TSWV compared to peanuts treated with an at-plant insecticide. We also saw a reduction in TSWV in the GA-12Y variety, which aligns with the documented TSWV resistance of this cultivar (Branch *et al.* 2023) and with findings from Cooke *et al.* (2025), who reported that GA-12Y had lower incidence of TSWV than GA-06G. These results agree with research showing that peanut genotypes express tolerance rather than complete resistance to TSWV, showing less severe symptoms despite still being infested with thrips (Shrestha *et al.* 2013). Broader germplasm evaluations have found that genotypic differences significantly influence both thrips feeding injury and TSWV infection levels (Chen *et al.* 2023), supporting our interpretation that genetic background of GA-12Y contributed to reduced virus impact and improved canopy maintenance.

Fractional green canopy coverage (FGCC) was influenced by treatment and variety in our study. FGCC is affected by cumulative early-season stress and is thus influenced by plant vigor, thrips injury, and TSWV symptom expression, so reduced thrips injury from at-plant insecticides likely contributed to more rapid and complete canopy development (Funderburk *et al.* 1998). Similarly, GA-12Y had greater FGCC than GA-06G. However, this difference should not be solely attributed to TSWV tolerance because GA-12Y also differs from GA-06G in vegetative growth characteristics and can produce substantial vine growth. Within both cultivars, greater TSWV incidence was associated with reduced FGCC, suggesting that TSWV negatively contributed to canopy development independently of the overall cultivar difference. Thus, greater canopy coverage observed in GA-12Y likely reflects a combination of inherent cultivar growth characteristics and responses to TSWV and other early-season stresses.

Our data showed no differences in peanut root-knot nematode eggs between variety or treatment. However, previous research has shown that the nematicides tested in this study can suppress peanut root-knot nematode populations. Aldicarb has reduced populations and increased peanut yield in field studies, while oxamyl has also provided suppression of root-knot nematodes (Rodríguez-Kábana *et al.* 1982, Rodríguez-Kábana *et al.*, 1985). Although treatment differences were not significant in our study, a similar numerical trend was observed, as egg densities were lower following AgLogic and Vydate. The lack of significant separation may be associated with the relatively low and variable nematode pressure during the study. Although the trial area had a history of peanut root-knot nematode infestation, nematode populations were not quantified prior to planting; therefore, initial nematode pressure could not directly be determined. Dry, drought-like conditions during the trials may have further limited nematode activity and reproduction. Soil moisture is the driver of nematode activity because nematodes rely on soil moisture for movement, feeding and host infection. Nematode abundance, biomass and activity have been shown to decline under drought conditions (Zhao *et al.* 2018, Zhao *et al.* 2024). Because environmental conditions can override management and varietal influences, drought years often mask differences among treatments, making it difficult to detect biological responses (Hajihassani *et al.* 2018, Nyaku *et al.* 2016).

Regardless of treatment, GA-06G outyielded GA-12Y by ~595 kg per ha in our study. There are varying results in the literature between the yield potential of these two varieties. Similarly, Standish *et al.* (2019) found that GA-06G had superior yield over GA-12Y under high fungicide input programs. However, Sidhu *et al.* (2019) found that GA-12Y outyielded GA-06G across multiple planting dates in a three-year study. Finally, Cooke *et al.* (2025) found no differences in yield between these cultivars across multiple planting dates in a two-year study. Differences in maturity between cultivars may have contributed to the yield response observed in our study. Because both cultivars were harvested at the same date, the later maturating GA-12Y may not have reached optimum maturity at harvest. Peanuts were not graded; therefore, we were unable

to use grade data to further evaluate potential differences in maturity at harvest. Although TSWV incidence differed between cultivar, overall, incidence was low, and other disease and late-season insect pressure was also low. Thus, yield losses associated with insects and disease were likely minimized.

We also found a significant increase in yield for at-plant insecticide treatment. Regardless of treatment, peanuts that received an at-plant insecticide treatment yielded ~1,044 kg per ha over the non-treated check. These results are in line with other studies evaluating the impact of at-plant insecticides on yield (Cooke *et al.* 2025, Zurweller *et al.* 2023, Brandenburg *et al.* 2021, Mahoney *et al.* 2018). Overall, our results confirm that protecting seedling peanut from early thrips injury can meaningfully improve yield, even in years with minimal TSWV, emphasizing that at-plant insecticide use remains a reliable, yield-protective management practice for April planted peanuts in Alabama.

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LITERATURE CITED

Abney M.R. 2022. Thrips & TSWV Management: This is Your One Chance, Don't Mess Up. University of Georgia Peanut Entomology. https://site.extension.uga.edu/peanutent/2022/04/thrips-tswv-management-this-is-your-one-chance-dont-mess-up/.

Beattie W.R. 1920. Peanut Growing for Profit. United States Department of Agriculture Farmers' Bulletin – 1127. https://archive.org/details/CAT87202936. Accessed 02 Nov 2026.

Branch W.D., Baldwin J.A., and Culbreath A.K. 2003. Genotype x Seeding Rate Interaction among TSWV-Resistance, Runner-Type Peanut Cultivars. *Peanut Sci.* 30:108-111. doi: 10.3146/pnut.30.2.0009.

Branch W.D., Brown N., and Brenneman T.B. 2023. Field screening for tomato spotted wilt and white mold (stem rot) resistance among peanut genotypes. *Peanut Sci.* 50(1):1-7. doi:10.3146/0095-3679-501-23-3.

Brandenburg R., Royals B. Taylor S. Malone S., Jordan D. and Hare A. 2021. Responses of tobacco thrips and peanut to imidacloprid and fluopyram. I. 7: e20116. doi: 10.1002/cft2.20116.

Chen Y., Pandey S., Catto M., Leal-Bertioli S., Abney M.R., Bag S., Hopkins M., Culbreath A., Srinivasan R. 2023. Evaluation of wild peanut species and their allotetraploids for resistance against thrips and thrips-transmitted tomato spotted wilt orthotospovirus. *MDPI Path.* 12(9):1-17. doi: 10.3390/pathogens12091102.

Cooke C.A., K. Balkcom, K. Martin, A. Strayer-Scherer and S.H. Graham. 2025. Impact of variety, planting date and at-plant insecticide on thrips and tomato spotted wilt virus management in Alabama peanuts. *Peanut Sci.* doi:10.3146/0095-3679-52.1-PS1630.

Culbreath A.K., Todd J.W., and Demski J.W. 1992. Productivity of Florunner Peanut Infected with Tomato Spotted Wilt Virus. *Peanut Sci.* 19(1):11-14. doi: 10.3146/i0095-3679-19-1-3.

Dickson D.W. and De Waele D. 2005. Nematode Parasites of Peanut. *Plant Parasitic Nematodes in Subtropical and Tropical Agriculture*. 2:393-436. doi: 10.1079/9780851997278.0393.

Funderburk J.E., Gorbet D.W., Teare I.D., and Stavisky J. 1998. Thrips injury can reduce peanut yield and quality under conditions of multiple stress. *Agron. J.* 90:563-566. doi: 10.2134/agronj1998.00021962009000040020x.

Garcia L.E., Brandenburg R.L., and Bailey J.E. 2000. Incidence of tomato spotted wilt virus (*Bunyaviridae*) and Tobacco Thrips in Virginia-Type Peanuts in North Carolina. *Plant Disease*. 84(4):459-464. doi: 10.1094/PDIS.2000.84.4.459.

Grabau Z.J., Mauldin M.D., Habteweld A., and Carter E.T. 2020. Nematicide efficacy at managing *Meloidogyne arenaria* and non-target effects on free-living nematodes in peanut production. *J. Nematology*. 52:1-10. doi: 10.21307/jofnem-2020-028.

Grabau Z.J., Sandoval-Ruiz R., Singh S., Thoms M.F., Liu C., Oyetunde A.K., and Singh H. 2025. Resistant peanut cultivars reduce peanut root-knot nematode infestation in field production. *Agronomy J.* 117(6): 1-10. doi: 10.1002/agj2.70249.

LaTora G.A., Lai P., Chen Y., Gautam S., Abney M.R., Srinivasan R. 2022. Frankliniella fusca (Thysanoptera: Thripidae), The Vector of Tomato Spotted Wilt Orthotospovirus Infecting Peanut in the Southeastern United States. *J. Integrated Pest Mgmt.* 13 (1). doi: 10.1093/jipm/pmab045.

Hajihassani A., Lawrence K.S., and Jagdale G.B. 2018. Plant Parasitic Nematodes in Georgia and Alabama. pp. 357-391 In Subbotin S., and J. Chatambar (eds), Plant Parasitic Nematodes in Sustainable Agriculture of North America. Springer, Cham. https://doi.org/ 10.1007/978-3-319-99588-5_14.

Hagan A.K., Bowen K.L., Strayer-Scherer A., Campbell H.L., and Parker C. 2025. Interaction of peanut root-knot susceptible and resistant cultivars with nematicides for

managing *Meloidogyne arenaria* and yield response in peanut. *Peanut Sci.* 52(1):38-49. doi: 10.3146/0095-3679-52.1-PS1639.

Huseth A.S., Chappell T.M., Langdon K., Morsello S.C., Martin S., Greene J.K., Herbert A., Jacobson A.L., Reay-Jones F.P., Reed T. and Reisig D.D. 2016. *Frankliniella fusca* resistance to neonicotinoid insecticides: an emerging challenge for cotton pest management in the eastern United States. *Pest Mgmt. Sci.* 72: 1934-1945.

Hussey R. S., and Barker K. R. 1973. A comparison of methods of collecting Inocula of *Meloidogyne* spp. including a new technique. *Plant Disease Reporter*. 57:1025-1028.

Jenkins W. 1964. A rapid centrifugal-flotation technique for separating nematodes from soil. *Plant Disease Reporter*. 48:692.

Jones M.G.K. 1981. Host cell responses to endoparasitic nematode attack: structure and function of giant cells and syncytia. *Ann. Appl. Biol.* 917:353-357. doi: 10.1111/j.1744-7348.1981.tb05122.x.

Mahoney D.J., Jordan D.L., Brandenburg R.L., Royals B.R., Inman M.D., Hare A.T., and Shew B.B. 2018. Influence of planting date and insecticide on injury caused by tobacco thrips and peanut yield in north carolina. *Peanut Sci.* 45(2):70-74. doi: 10.3146/0095-3679-45.2.70.

Marasigan K., Toews M., Kemerait R., Abney M.R., Culbreath A., and Srinivasan R. 2015. Evaluation of alternatives to carbamate and organophosphate insecticides against thrips and tomato spotted wilt virus in peanut production. *J. Economic Entomology*. 109(2):544-557. doi:10.1093/jee/tov336.

Minton N.A. and Baujard P. 1990. Nematode Parasites of Peanut. Plant-parasitic nematodes in subtropical and tropical agriculture. Wallingford, UK: CAB International (1990): 285-320. https://horizon.documentation.ird.fr/exl-doc/pleins_textes/2021-09/34395.pdf#page=303.

Moor J.C., Catchot A., Cook D., Crow W.D., Dobbs D.M., Sarver J.M., Towles T.B., and Zurweller B. 2021. Effect of imidacloprid and acephate for tobacco thrips (Thysanaptera Thripidae) management on flumioxazin injured peanut. *Peanut Sci.* 48(1):6-14. doi: 10.3146/PS20-14.1.

National Peanut Board. 2026. National Peanut Board Unveils Bold Brand Platform to Unify America's Peanut Industry. https://nationalpeanutboard.org/articles/national-peanut-board-unveils-bold-brand-platform-to-unify-americas-peanut-industry/ Accessed 22 Oct 2026.

Nyaku S.T., Kanetety R.V., Cebert E., Lawrence K.S., Honger J.O., and Sharma G.C. 2016. Principal component analysis and molecular characterization of reniform nematode populations in Alabama. *Plant Pathol J.* 1; 32(2):123-135. doi: 10.5423/PPJ.OA.09.2015.0194.

Rodríguez-Kábana R., Shelby R.A., King P.S., and Pope M.H. 1982. Application time and effectiveness of four systemic nematicides against *Meloidogyne arenaria* on Florunner peanut. *Nematropica*. 12:85–96.

Rodríguez-Kábana R., Weaver C.F., and King P.S. 1985. Combinations of 1-3-D and aldicarb for management of *Meloidogyne arenaria* in peanuts. *Nematropica*. 15(1):93-106.

Sidhu S.S., van Santen E., George S., Small I., and Wright D.L 2019. Effect of planting date and irrigation on yield and grade in runner-type peanut cultivars in north Florida. *Peanut Sci.* 46(2):191-197. doi: 10.3146/PS19-2.1.

Shrestha A., Srinivasan R., Sundaraj S., Culbreath A.K., Riley D.G. 2013. Second generation peanut genotypes resistant to thrips-transmitted tomato spotted wilt virus exhibit tolerance rather than true resistance and differentially affect thrips fitness. *J. Econ. Entomol.* 106(2):587-596. doi: 10.1603/EC12430.

Shrestha A., Sundaraj S., Culbreath A.K., Riley D.G., Abney M.R., and Srinivasan R. 2015. Effects of thrips density, mode of inoculation, and plant age on tomato spotted wilt virus transmission in peanut plants. *Env. Entomology*. 44(1):136-143. doi: 10.1093/ee/nvu013.

Srinivasan R., Abney M.R., Culbreath A.K., Kemerait R.C., Tubbs R.S., Monfort W.S., and Pappu H.R. 2017. Three decades of managing tomato spotted wilt virus in peanuts in southeastern United States. *Virus Research*. 241:203-212. doi: 10.1016/j.virusres.2017.05.016.

Srinivasan R., Abney M.R., Lai P., Culbreath A.K., Tallury S., Leal-Bertioli S.C.M. 2018. Resistance to thrips in peanut and implications for management of thrips and thrips-transmitted orthotospoviruses in peanut. *Front Plant Sci.* 9:1604. doi: 10.3389/fpls.2018.01604.

Standish J.R., Culbreath A.K., Branch W.D., and Brenneman T.B. 2019. Disease and yield response of a stem-rot-resistant and -susceptible peanut cultivar under varying fungicide inputs. *Plant Disease*. 103:2781-2785. doi: 10.1094/PDIS-04-19-0771-RE.

Starr J.L. and Morgan E.R. 2002. Management of the peanut root-knot nematode, Meloidogyne arenaria, with host resistance. *Plant Health Progress*. doi: 10.1094/PHP-2002-1121-01-HM.

[USDA NASS] United States Department of Agriculture, National Agriculture Statistics Service. 2022. Alabama Agricultural Facts. https://www.nass.usda.gov/Statistics_by_State/Alabama/Publications/More_Features/ALAgFacts.pdf. Accessed 21 Oct 2026.

[USDA NASS] United States Department of Agriculture, National Agriculture Statistics Service. 2025. Southern

Region News Release Annual Crop Production. https://www.nass.usda.gov/Statistics_by_State/Regional_Office/Southern/includes/Publications/Crop_Releases/Annual_Summary/AnnualCropProd2024.pdf. Accessed 21 Oct 2026.

Wright D.L., Tillman B.L., Small I.M., Pratap D., Grabau Z., Paula-Moraes S., Carter E., Ferrell J.A., Mulvaney M.J., Barrett C., and DuFault N. 2016. Management and culutral practices for peanuts. University of Florida, IFAS Extension. https://pdfs.semanticscholar.org/d3a9/ec964a94022f7c1ff4563deb3e9f362c0d28.pdf. Accessed 21 Oct 2026.

Zhao C., Fan R., Li X., Fan L., Zhang L., Yan X., Zhao X., Miao Y., Sun Y., Shao Y., Li G., and Fu S. 2024. Drought reduces peanut yield indirectly through regulating soil nematode community in a manipulative field experiment in central china. *Applied Soil Ecology*. 199:1-5. doi: 10.1016/j.apsoil.2024.105400.

Zhao C., Sun F., Yu C., Zhu L., Li Y., Zhou Z., Yang G., Wang W., and Miao R. 2018. Soil nematode trophic groups in four different plantations in southern china: implications for restoration. *Pol. J. Environ. Stud.* 27(2):1379-1386. doi: 10.15244/pjoes/77031.

Zurweller B., Gore J., Graham S.H., Crow W.D., Towles T.B., and Cook D. 2023. Impact of variety and at-planting insecticide on thrips (*Thysanoptera: Thripidae*) management in peanut. *Peanut Sci.* 50(1):41-48. doi: 10.3146/0095-3679-501-PS22-10.