Farmer Insights on Harvesting Peanut: A Survey from the Virginia-Carolina Region of the United States

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Abbreviations: lbs., pounds.

Peanut (*Arachis hypogaea* L.) harvest is a two-step process that requires digging pods and inverting vines and threshing after pods and vines have dried for an adequate amount time for efficient separation of pods from vines with a combine. The plant growth regulator prohexadione calcium can be applied at mid-season when 50% of vines from adjacent rows are touching to limit vine growth so that rows can be tracked more easily during the digging process and to minimize pod loss as peanut plants are removed from soil and pass through the invertor (Mitchem et al., 1996). Within several weeks prior to digging, many growers will collect samples from fields and remove the exocarp to expose the mesocarp of pods. Pod mesocarp color becomes progressively darker as pods age and reflects maturity of kernels (Williams and Drexler, 1981). Pod maturity profile charts are then used to assist farmers in deciding when to dig peanut (Jordan, 2023; Williams and Drexler, 1981). Digging peanut one week prior to optimum maturity can prevent farmers from realizing significant pod yield (Jordan et al., 2016; Knauft et al., 1988; Mixon and Branch, 1985; Mozingo et al., 1991). However, delays in digging past optimum pod maturity can result in significant pod shed and lower yield. Weather patterns, including temperature and soil moisture, can affect the pod maturation process (Jordan, 2023). Additionally, inclement weather, soil moisture conditions, farm logistics, balance of equipment and acreage, plant health and disease incidence, and equipment setting and operation can affect harvest efficiency and yield.

In this Brief, we discuss responses of 166 farmers in North Carolina, South Carolina, and Virginia relative to their perceptions of challenges they face at harvest and how they address those challenges (Table 1). At the end of September 2022, Hurricane Ian (Bucci et al., 2023) affected peanut production areas of these states and is one reason why the survey was given at peanut production meetings in January and February 2023. No attempt was made to separate survey responses by state. Results from the survey represent approximately 48,000 acres in the region corresponding to 25% of planted acreage in 2022 (NASS, 2023). Self-reported yield was 4,746 lbs./acre (2,900 to 6,345 lbs./acre). Rainfall from Hurricane Ian in 2022 ranged from 2.18 to 4.19 inches at selected locations in the three states (Table 2) (NCSCO, 2023).

Fifty-two percent of growers indicated that they would dig pods and invert vines prior to a storm (data not presented in tables). Thirty-one percent indicated that they would dig after the storm and 17% mentioned they would dig both before and after a storm event. Forty-two percent listed pod maturity as the determining factor with 36% mentioning wet fields (Table 3). Ten to 18% stated that soil texture and drainage, projected rain, vine health, and pod loss were high on the list for their decision. Some farmers listed hull brightness and washing of dug vines out of the field as reasons for their decision on when to dig. A major focus of the commercial peanut production in these states is the in-shell trade. Producing peanut with bright hulls with limited discoloration is a major goal of farmers and aggregators. While there is not a premium for hull brightness under current marketing arrangements, growers who can routinely deliver peanut that have uniformly bright hulls often maintain and in some cases increase contracts with aggregators. Rainfall after digging and before threshing can result in pods that are less desirable for this characteristic. Digging pods prior to optimum maturity can also result in non-uniformity in pod brightness.

A major element of deciding when to dig peanut is related to minimizing losses during this field operation. When pooled over farmers, digging losses were estimated to be 8% of optimum yield with a range of 2 to 30% (data not shown in tables). Thirty-six percent of farmers indicated that equipment or pod maturity affected pod loss (Table 4). Deteriorating vine health and excessive vine growth were listed at about 11% each as contributors to pod loss during digging. Pod shed, variety selection, and digging flat ground in strip-till systems were also listed. When the focus was on field conditions, growers listed dry soil (28%), hard soil (14%), and wet soil (9%) (Table 5).

With respect to equipment contributions to digging losses, challenges included setting the digger and vine inverter and digging too fast (Table 6). Not having ground speed and inverter action synchronized and imbalance of acreage and equipment were also listed. Late leaf spot [*Nothopassalora personata* (Berk. & M.A. Curtis) U. Braun, C. Nakash., Videira & Crous], Sclerotinia blight (caused by *Sclerotinia minor* Jagger), and two-spotted spider mite (*Tetranychus urticae* Koch) were listed as pests that contributed to digging losses (Table 7). Peanut yield can be affected by the interaction of leaf spot incidence and digging date (Carley et al., 2009; Chapin et al., 2005; Jordan et al., 2016). An equal number of growers listed having excessive vine growth and poor plant health as challenges (Tables 7 and 8).

With respect to excessive vine growth, just under 48% of growers indicated that they applied prohexadione calcium (Apogee, BASF Corp., Research Triangle Park, NC or Kudos, Fine Americas, city) once while just under 29% applied this plant growth regulator twice (data not shown in tables). Only 1% indicated that three applications of prohexadione calcium were made. In a previous survey completed in 2018, Jordan et al. (2019) reported that 49% of growers applied prohexadione calcium. In the survey, no distinction between the number of applications of prohexadione calcium was made.

Three percent of growers indicated that burrower bug (*Pangaeus bilineatus* Say) caused damage to peanut while 22% indicated that southern corn rootworm (*Diabrotica undecimpunctata* Howardi Barber) damage was present in peanut (data not shown in tables). The Environmental Protection Agency (EPA) revoked tolerances in food crops including peanut for chlorpyrifos prior to the 2022 growing season (EPA, 2021). Revocation of tolerances rendered chlorpyrifos illegal for use in peanut. This insecticide was previously used routinely in the Virginia-Carolina Region of the U.S. to protect peanut pods from injury caused by southern corn rootworm (Brandenburg, 2023). Chlorpyrifos was applied to control lesser corn stalk borer (*Elasmopalpus lignosellus* Zeller), southern corn rootworm, and burrower bug (Abney, 2020; Aigner at al., 2021). The question relative to damage from these insects was designed to establish a baseline for damage from these pests in the absence of chlorpyrifos. Currently, there are no pesticides that control burrower bug and southern corn rootworm in peanut (Anco, 2023; Brandenburg, 2023).

A high percentage of growers indicated that pod maturity was the major driver for decisions on when to dig rather than impending issues associated with tropical weather. While variation in peanut yield has been noted based maturity of pods and kernels at the time of digging and vine inversion, digging one week early has been estimated to prevent growers from realizing 5-8% of yield potential (Jordan et al., 2016). When peanut remain in the field after optimum pod maturity occurs, pods can shed and result in substantial yield loss (Jordan et al., 2016). Results from this survey also inform practitioners on the impact of not only wet soil on pod loss but also soil that is dry and difficult to penetrate with digging equipment. Rainfall from tropical events, including Hurricane Ian, can improve soil conditions for digging and vine inversion. The caveat is the amount of rain that occurs for a single event and the possibility of additional rainfall events that can delay digging to the point where pods shed from plants and decrease yield. Several points from the survey can be used in education programs for growers relative to making proper adjustments for digging equipment and use of that equipment. The survey also reveals use patterns for prohexadione calcium for suppression of vine growth.

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Conflicts of Interest

The authors express no conflicts of interest.

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Table 1. Survey questions used at peanut production meetings in North Carolina, South Carolina, and Virginia in 2023.

1	Acreage in 2022
2	Yield per acre in 2022
3	Would you prefer that your peanut be on top of the ground during a hurricane or still in the ground? (circle your answer)
	Dig before the storm
	Dig after the storm
4	What are the primary reasons for your decision?
5	What is your overall estimate of yield loss due to digging? Provide a percentage of optimum yield.
6	Why do you think you had those losses?
7	Did you apply Apogee or Kudos? (circle your answer)
	No applications
	1 application
	2 applications
	3 applications
8	Did you have damage from the following insects in 2022? (circle your answer)
	Southern corn rootworm

Burrower bug

Table 2. Rainfall from Hurricane Ian on September 30, 2022 in selected municipalities in North Carolina, South Carolina, and Virginia.[a]

City and State	Inches of rain
Wakefield, VA	1.11
Lewiston-Woodville, NC	4.19
Rocky Mount, NC	3.96
Clinton, NC	2.17
Whiteville, NC	3.28
Florence, SC	3.05
Orangeburg, SC	2.18

[a]Source: North Carolina State Climate Office.

Table 3. Reasons for digging peanut prior to or after a storm.[a]

Reason	Number of times mentioned
Pod maturity	42
Wet fields	36
Pod loss	18
Vine health	15
Projected rain	14
Soil texture and field drainage	10
Washing dug vines off the field	6
Hull brightness	2

[a]Data are from 166 surveys provided by farmers in North Carolina, South Carolina, and Virginia representing 48,000 acres in 2022.

Table 4. Reasons listed as causes of digging losses in 2022.[a]

Reason	Number of times mentioned
Field conditions	72
Equipment	37
Pod maturity	36
Vine growth	13
Vine health	12
No major issues	10
Weather	9
Pod shedding	3
Cultivar	3
Flat ground and/or strip till	2

[a]Data are from 166 surveys provided by farmers in North Carolina, South Carolina, and Virginia representing 48,000 acres in 2022.

Table 5. Reasons for digging losses in 2022 associated with field conditions.[a]

Reason	Number of times mentioned
Dry soil	28
Hard soil	14
Soil conditions	12
Wet soil	9
Soil texture	7
Digging characteristics[b]	2

[a]Data are from 166 surveys provided by farmers in North Carolina, South Carolina, and Virginia representing 48,000 acres in 2022.

[b]The phrase "digging characteristics" most likely refers to soil conditions.

Table 6. Reasons for digging losses in 2022 associated with equipment or equipment operation.[a]

Reason	Number of times mentioned
Equipment malfunction or improper setting	12
Issues with digger and inverter	9
Ground speed too fast during digging	7
Ground speed and inverter not synchronized	3
Acreage and harvest equipment not balance	2
Digger set too deep	1
Vine inverter functioning improperly	1
Operator error	1

[a]Data are from 166 surveys provided by farmers in North Carolina, South Carolina, and Virginia representing 48,000 acres in 2022.

Table 7. Reasons for digging losses in 2022 associated with peanut vine health and pests.[a]

Reason	Number of times mentioned
General health of peanut vines and pegs	8
Leaf spot diseases	2
Sclerotinia blight disease	1
Two-spotted spider mite	1

[a]Data are from 166 surveys provided by farmers in North Carolina, South Carolina, and Virginia representing 48,000 acres in 2022.

Table 8. Reasons for digging losses in 2022 due to excessive vine growth.[a]

Reason	Number of times mentioned
Excessive vine growth	8
GPS system was not used or did not function properly	2
Twin row planting pattern	2
Did not apply a plant growth regulator	1

[a]Data are from 166 surveys provided by farmers in North Carolina, South Carolina, and Virginia representing 48,000 acres in 2022.