



Growing 'Titan': A Large-Seeded, Virginia-Type Peanut for Specialty Markets

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The new peanut variety Titan was released by Virginia Cooperative Extension's Tidewater Agricultural Research and Extension Center (AREC) in 2010. Titan is an extra-large seeded peanut with an exceptionally high content of jumbo pods and super-extra-large kernels (super-ELK; Balota et al. 2011). It has the largest jumbo pod content of any cultivar available at this time, with values ranging from 69 to 97 percent in tests conducted from 1997 to 2008. Titan had 36 to 60 percent super-ELK content with seeds averaging 1,437 mg per seed. Because of these characteristics, Titan is well-suited for in-shell use and for gourmet and green boiling products.



Origination

Titan is an F₄-derived line from the cross of VA 8911215 with 'Shosh' — a cross made by Terry Coffelt, former peanut breeder with the U.S. Department of Agriculture's Agricultural Research Service in Suffolk, Va. Shosh is an Israeli cultivar developed at the Volcani Institute of the Israeli Ministry of Agriculture's Agricultural Research Organization at Bet Dagan, Israel. VA 8911215 is an experimental line selected from the cross of VA 780839P with VA 81B; it is a sister of VA 98R and is closely related to NC-V 11.

After the initial cross, Titan was tested as VT 95060083-3 by Walton Mozingo and the Peanut Variety and Quality Evaluation (PVQE) staff members at the Tidewater AREC. In 2007 and 2008, Titan was included in the official PVQE trials at multiple locations in Virginia, North Carolina, and South Carolina.

Agronomic Characteristics

Titan is a unique, Virginia-type peanut (*Arachis hypogaea* L. subsp. *hypogaea* var. *hypogaea*) with pod and kernel characteristics such as shape, size, and color that make it acceptable for the in-shell, gourmet, and green boiling markets. Data from the 2007 and 2008 PVQE tests on Titan and other varieties can be accessed at <http://pubs.ext.vt.edu/category/crops.html>.

Titan has a runner growth habit and develops flat lateral branches and a prominent upright main stem of approximately 13 inches (fig. 1). Fewer lateral branches have been observed on Titan than on most cultivars with a runner growth habit. Leaves are larger than most other peanut cultivars and dark green in color. Seeds are elongated with a testa color of light pink to pink.



Figure 1. *Top*, Titan in irrigated plots at the Tidewater Agricultural Research and Extension Center in Suffolk, Va.; and *bottom*, at a dryland plot near Williamston, N.C., in 2010.

Titan has a significantly greater content of jumbo pods and super-ELK than Gregory, a popular large-seeded cultivar grown in the Virginia, North Carolina, and South Carolina production area (tables 1-3; see appendix for explanations of abbreviations used in the tables). The extra-large kernels (ELK) are nearly as large as the super-ELK of most other cultivars, and the medium-size kernels are nearly as large as the ELK of other cultivars (table 1).

According to tests at multiple locations in 2007 and 2008, the content of jumbo pods of Titan is significantly higher than that of all other current commercial



Figure 2. Pod and kernel size of Titan. Ruler scale is in centimeters.

cultivars, including Gregory, at most locations (table 4). Pod brightness, another important characteristic for in-shell products, is also good in Titan.

Per-acre yields for Titan will typically be lower than for other Virginia market-type cultivars (tables 5 and 6). However, acceptable yields for Titan can be produced under irrigation. Lower yields are likely due to higher demand for nutrients and water to achieve maximum kernel and pod size for Titan than for cultivars with smaller kernels and pods (fig. 2).

For data averaged across locations and years, Titan showed medium susceptibility to tomato spotted wilt virus, *Sclerotinia* blight, and *Cylindrocladium* black rot (table 7). In particular, its sparse branches allow good stem aeration, reducing the risk of infection by *Sclerotinia* spp. Titan also has better calcium uptake than Gregory, which could be advantageous when grown for seed production, and good blanching of the ELK and medium kernels. Finally, Titan has conventional oil chemistry with a ratio of oleic to linoleic acid of 2.

Table 1. Jumbo pod content and seed count for medium and extra-large kernels of Titan and other varieties from unreplicated large plots (0.5 acre) at the Tidewater Agricultural Research and Extension Center in Suffolk, Va., in 2009. Six 1-pound samples were randomly collected from different locations throughout each plot and graded. (See appendix for explanations of abbreviations used in the tables.)

Variety	Jumbo pod	Medium kernel count	ELK count ^a
	%	seed/lb	
Bailey	23 d ^b	618 cd	448 ab
CHAMPS	35 d	580 d	419 c
Gregory	75 ab	636 bc	416 c
NC-V 11	32 d	668 b	464 a
Perry	44 c	639 c	435 bc
Phillips	35 cd	738 a	451 a
VT 024051	69 b	550 d	398 c
Titan	85 a	569 d	340 d

^a Extra-large kernels (ELK) usually have 512 seed per pound or fewer; seeds with 380 seed per pound or fewer are considered super-extra-large kernels.

^b Means followed by the same letter within a column are not statistically different by t-test ($p < 0.05$).

Table 2. Comparison of Titan, CHAMPS, Bailey, VT 024051, and Gregory for the jumbo pod content and extra-large kernels. Data are from Peanut Variety and Quality Evaluation's small plots at five locations in Virginia, North Carolina, and South Carolina in 2008. Seeds from all replications within each location were mixed, and a composite sample per location was graded ($n = 5$).

Variety	Jumbo pod	ELK ^a	Super-ELK	Super-ELK	Super-ELK
			(26/64 & 28/64 1-inch screen)	(26/64 1-inch screen)	(28/64 1-inch screen)
			%		
CHAMPS	49 b ^b	50 bc	1 c	1 c	0 b
Bailey	31 b	52 bc	1 c	1 c	0 b
VT 024051	80 a	56 c	2 c	2 c	0 b
Gregory	81 a	48 b	9 b	7 b	1 b
Titan	85 a	38 a	16 a	13 a	3 a

^a Kernels that do not pass a 24.5/64 × 1-inch slotted screen but pass a 21.5/64 × 1-inch screen.

^b Means sharing the same letter(s) within a column are not statistically different by t-test ($p = 0.05$).

Table 3. Seed count for the super-extra-large, extra-large, and medium kernels from Peanut Variety and Quality Evaluation's small plots at five locations in Virginia, North Carolina, and South Carolina in 2008. Seeds from all replications within each location were mixed, and a composite sample per location was graded (n = 5).

Variety	Super-ELK ^a count	ELK ^b count	Medium kernel count
	seed/lb ^c		
Gregory	338 b ^d	389 a	613 b
Titan	303 a	370 a	533 a

^a Super-extra-large kernels usually have 380 seed per pound or fewer.

^b Extra-large kernels usually have 512 seed per pound or fewer.

^c To obtain seed per kilogram, divide seed per pound by 0.454.

^d Means sharing the same letter(s) within a column are not statistically different by t-test (p = 0.05).

Table 4. Jumbo pod content of Titan compared to 11 other commercial cultivars from Peanut Variety and Quality Evaluation's small plots at six locations in 2007 and five locations in 2008 in Virginia, North Carolina, and South Carolina. Each year, two to three replicated plots were planted at each location. At the Tidewater Agricultural Research and Extension Center in Suffolk, Va., and at Martin County, N.C., two digging dates (Sept. 30 and Oct. 8) were considered (n = 37).

Variety	Bladen Co., N.C.	Duplin Co., N.C.	Florence, S.C.	Martin Co., N.C.	Southampton Co., Va.	Suffolk, Va.
	%					
Bailey	49 de ^a	32 f	52 de	37 g	48 d	41 f
Brantley	71 b	59 b-d	71 ab	64 bc	76 a	74 b
CHAMPS	63 bc	51 c-e	50 de	48 ef	52 cd	57 c
Gregory	84 a	73 a	75 a	72 ab	77 a	83 a
NC 12 C	58 cd	55 b-d	62 bc	57 cd	66 b	75 b
NC-V 11	53 de	44 d-f	43 de	37 g	51 cd	49 de
Perry	51 de	44 d-f	42 de	36 g	51 cd	56 cd
Phillips	53 de	45 d-f	43 de	52 de	59 bc	59 c
Sugg	55 c-e	60 a-c	54 cd	40 fg	48 d	48 ef
Titan	84 a	79 a	69 ab	76 a	81 a	86 a
VA 98R	47 e	37 ef	39 e	40 fg	50 d	47 ef
Wilson	59 cd	49 d-f	51 c-e	49 de	52 cd	58 c
MEAN	61	52	54	51	59	61

^a Means followed by the same letter(s) within a column are not statistically different by t-test (p < 0.05).

Table 5. Agronomic and grade characteristics of Titan compared to 11 other commercial cultivars from Peanut Variety and Quality Evaluation's small plots at six locations in 2007 and five locations in 2008 in Virginia, North Carolina, and South Carolina. Each year, two to three replicated plots were planted at each location. Peanut was dug on Sept. 30 (n = 29).

Variety	Fancy	ELK	DK	SMK	Total kernels	Yield ^a
			%			lb/acre
Bailey	86 d ^b	44 d-g	2.27 c	65 a	72.4 ab	5,601 a
Brantley	93 ab	51 a	2.88 a-c	64 ab	71.9 b	5,187 a-c
CHAMPS	89 c	44 d-f	2.94 a-c	65 a	73.0 a	5,248 a-c
Gregory	93 a	47 b-d	3.75 ab	61 bc	69.2 c	5,040 b-d
NC 12 C	89 c	49 ab	2.66 bc	65 a	73.1 a	4,842 cd
NC-V 11	86 d	40 gh	2.44 c	64 a	72.0 b	5,468 ab
Perry	84 d	43 e-g	2.84 a-c	64 ab	72.5 ab	4,615 d
Phillips	89 c	49 a-c	2.54 c	65 a	73.2 a	5,226 a-c
Sugg	91 bc	46 b-e	3.02 a-c	64 ab	73.2 a	5,194 a-c
Titan	92 a-c	45 c-f	3.87 a	56 d	65.9 d	3,989 e
VA 98R	84 d	42 fg	3.16 a-c	63 ab	72.8 ab	5,258 a-c
Wilson	90 bc	37 h	2.72 bc	60 c	69.2 c	5,342 a-c

^a All yields are net, adjusted to standard 7% moisture and foreign material is deducted.

^b Means sharing the same letter(s) within a column are not statistically different by t-test (p = 0.05).

Table 6. Agronomic and grade characteristics of Titan and 11 other commercial cultivars from the Peanut Variety and Quality Evaluation small plots at two locations in Virginia and North Carolina in 2007 and 2008. Each year, two replicated plots were planted at Suffolk, Va., and Martin County, N.C. Peanut was dug on Oct. 8 (n = 8).

Variety	Fancy	ELK	DK	SMK	Total kernels	Yield ^a
			%			lb/acre
Bailey	86 de ^b	46 cd	1.78 b	68 a	74.2 a-c	5,936 a
Brantley	92 a-c	56 a	3.41 ab	66 ab	73.7 bc	5,412 a
CHAMPS	88 b-d	43 de	3.35 ab	67 a	74.6 a-c	5,718 a
Gregory	95 a	52 ab	3.44 ab	65 bc	71.3 d	5,662 a
NC 12 C	86 c-e	50 a-c	3.34 ab	67 ab	73.7 bc	5,181 ab
NC-V 11	83 de	42 de	2.08 b	67 ab	73.5 c	5,844 a
Perry	84 de	44 d	1.83 b	67 ab	73.9 a-c	5,556 a
Phillips	89 a-d	52 ab	2.64 b	67 ab	74.6 a-c	5,656 a
Sugg	87 b-d	50 bc	1.63 b	68 a	74.8 ab	5,781 a
Titan	93 ab	45 cd	5.24 a	58 d	67.4 e	4,563 b
VA 98R	81 e	46 cd	2.58 b	67 ab	74.9 a	5,778 a
Wilson	88 b-d	38 e	3.39 ab	63 c	70.7 d	5,489 a

^a All yields are net, adjusted to standard 7% moisture, and foreign material is deducted.

^b Means followed by the same letter within a column are not statistically different by t-test (p < 0.05).

Table 7. Disease rating of Titan and 11 other commercial cultivars from the Peanut Variety and Quality Evaluation small plots at six locations in 2007 and five in 2008 in Virginia, North Carolina, and South Carolina. Each year, two to three replicated plots were planted at each location (n = 37).

Variety	Tomato spotted wilt virus	Sclerotinia blight	Cylindrocladium black rot
	incidence ^a		
Bailey	1.6 c b	0.8 c	0.0 c
Brantley	6.9 a	2.6 ab	1.0 a
CHAMPS	5.8 ab	0.8 c	0.1 c
Gregory	3.6 bc	2.0 a-c	0.1 ab
NC 12 C	6.9 a	3.6 a	0.2 bc
NC-V 11	4.5 ab	1.1 bc	0.1 c
Perry	5.4 ab	2.5 ab	0.3 bc
Phillips	6.9 a	2.4 a-c	0.1 c
Sugg	2.3 bc	1.1 bc	0.0 c
Titan	6.5 a	2.1 a-c	0.4 bc
VA 98R	4.8 ab	1.4 bc	0.3 bc
Wilson	6.9 a	1.7 bc	0.1 c

^a Incidence is expressed as the number of infection centers in two 35-foot rows/plot. An infection center was a point of active disease growth and included 6 inches on either side of that point.

^b Means followed by the same letter(s) within a column are not statistically different by t-test (p < 0.05).

Tips to Successfully Grow Titan

Titan was released as a specialty peanut and as such, it should be managed as a specialty crop. For growers to be successful with Titan, there are several important considerations.

- Planted acreage for this variety should be moderate, probably fewer than 20 acres.
- It should be planted on good peanut land and — as much as possible — away from wooded areas because it is susceptible to deer damage (fig. 3).
- In experimental plots in Virginia and North Carolina, Titan was selectively grazed by deer over other cultivars, regardless of the plot's location within the field.
- At planting, use four or five seeds per row foot, rather than three.
- The seed is large and if kernel moisture is 5 percent or less, it can easily split and result in a lower-than-optimum plant population.



Figure 3. A plot (two rows) of Titan at the Taylor Slade farm in Martin County, N.C., with leaves grazed by deer, while the other plots were intact, 2010.

- In our research plots, using a vacuum planter with Titan was challenging, and larger plates were used. Therefore, use plates DS3665 (36 holes, 6.5 mm size) or larger, rather than DS4060. Even when using this planting equipment, stand counts may be lower for Titan compared with other cultivars.
- With Titan, irrigation is needed for optimal production and yield. For good emergence and stand, Titan must have plentiful soil moisture. If it is not possible to plant after a good rain, do not plant at all or be ready to irrigate to ensure good emergence. Titan is also sensitive to drought at flower and peg stages. It starts flowering early, 40 to 45 days after planting. Even though Titan produces masses of flowers and pegs, the pegs will not penetrate the soil if the soil is dry and hot (fig. 4).
- Keep in mind that the timeframe starting at pegging through 20 days after pegs enter the soil is the most critical time for calcium absorption. Depending on the season and planting time, peanuts will first peg around 60 days after planting. So, within 70 days after planting, calcium must be available in the soil solution. This means two things: (1) early application is better than late application of gypsum, and (2) water is needed to move calcium from gypsum into the pegging zone and to keep soil calcium in solution and available to the pods.



Figure 4. Under drought conditions, the pegs of Titan will not enter the soil but will dry on the surface.

- If rainfall does not occur after application of gypsum, irrigation is needed. For seed production, the gypsum application rate can be increased from 1,200 to 1,500 pounds per acre.
- As seed is filling the pod cavity at approximately 90 days from planting, irrigation may be needed again if rainfall is scarce.
- Titan is an early cultivar that matures approximately five days earlier than NC-V 11. Consider determining the optimum harvest maturity (65 to 70 percent of harvestable pods have orange, brown, or black mesocarp) and harvest rather than waiting for pods to reach advanced maturity. Over-mature Titan pods shed easily.

Growing Titan peanut successfully requires some additional management and perhaps added input costs relative to traditional Virginia market-type cultivars. However, when producing for niche or specialty markets that place premium value on very large seed size, the added management and input cost may be well-warranted. For example, in 2.4-acre plots in Suffolk, Va., the total shelling for Titan was 65 percent, from which the super-extra-large and extra-large kernel content was 54 percent, medium was 17 percent, and No. 2 was 10 percent when shelling at a commercial facility.

Summary of Important Considerations for Growing Titan

- Planted acreage should be moderate, on good land, and away from wooded areas, if possible.
- Plant five seeds per row foot and use larger size planter plates than for other cultivars.
- Plant only where irrigation is available.
- Apply gypsum at flowering and irrigate if rainfall is limited after calcium application.
- Apply 1,200 to 1,500 pounds per acre of gypsum for Titan seed production.
- Harvest at 65 to 70 percent of harvestable pods (yellow, orange, brown, and black mesocarp).

Appendix. Abbreviations Used in Tables

% DK (damaged kernels) – Percentage of moldy and decayed kernels or kernels with skin and flesh discoloration due to insects and weather damage.

% ELK (extra-large kernels) – Percentage of kernels that fell through a $21.5/64 \times 1$ -inch slotted screen.

% Fancy – Percentage of pods that pass through a $38/64$ -inch opening and rode a $34/64$ -inch opening on the presizer.

% Jumbo – Percentage of pods that rode a $38/64$ -inch opening on the presizer.

% Super-ELK (super-extra-large kernels) – Percentage of kernels that fell through $26/64 \times 1$ -inch and $28/64 \times 1$ -inch slotted screens.

% SMK (sound mature kernels) – Percentage of whole kernels that fell through a $15/64$ -inch \times 1-inch slotted screen; splits that ride this screen are included as sound splits or damaged kernels, as the case may be.

% TK (total kernels) – Percentage of all kernels in the shelling sample, including sound mature kernels, split sounds, other kernels, and damaged kernels.

Yield (lb/acre) – Plot weights converted to a pounds-per-acre basis. All yields are adjusted to standard 7 percent moisture with a percentage of foreign material deducted.

Reference

Balota, M., W. R. Mozingo, T. A. Coffelt, T. G. Isleib, B. R. Beahm, H. G. Pittman, F. S. Bryant, P. A. Copeland, C. J. Daughtrey, B. C. Kennedy, F. M. Shokes, R. D. Ashburn Jr., D. L. Whitt, and D. A. Redd. 2011. "Registration of 'Titan' Peanut." *Journal of Plant Registrations* 5:282-288.