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Lessons Learned from Peanut Variety Testing in 2022

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Introduction

Peanut (*Arachis hypogaea* L.) is an important crop for the agricultural production system in southeastern Virginia. With annual acreage at around 25K and 4,500 pounds per acre yield, peanut is a profitable crop and good rotation choice for the other commodities. For example, in 2022, peanut production value in Virginia was a little over $35 million from only 27,000 acres, which represents a gross profit of $1,300 per acre, surpassing any other field crop (USDA-NASS, 2023).

Virginia-market type is the peanut type predominantly grown in Virginia, as well as in North Carolina and South Carolina, the three states representing the VC peanut growing region within the US peanut belt. These are large-seeded, gourmet peanuts highly prized not just by consumers, but also by the industry in the VC that evolved around this market type, including a large number of shellers and processors of gourmet and in-shell products. Improved cultivars meeting industry standards are regularly released by the North Carolina State Univ. and Virginia Tech.

The Peanut Variety and Quality Evaluation (PVQE) program, a multi-state program created in 1968, annually evaluates the virginia-type breeding lines in "pipeline" for release across the VC region.

Description

Objectives

The objectives of the PVQE are to determine yield, grade and quality of commercial cultivars and advanced breeding lines at various locations in the VC region, develop a database for virginia-type peanut to allow research-based selection of the best genotypes by growers, industry, and the breeding programs, and to identify the best peanut varieties that can be developed into cultivars.

Figure 1. PVQE trials at TAREC Research Farm.

Plant Material

In 2022, PVQE included 19 advanced breeding lines developed by the North Carolina State University (NCSU) breeding program comparatively tested with released cultivars 'Bailey II',' Emery', 'N.C. 20', 'N.C. 21', 'Sullivan' and 'Walton'. All these varieties have the 'high oleic acid' characteristic.

Test Locations

Varieties were planted in replicated 210ft^2 plots from May 11 through May 24 at five locations: Tidewater AREC in Suffolk, VA, Slade Farm near Williamston, Martin Co., NC, the Upper Coastal Plain Research Station near Rocky Mount, NC, McDuffie Farm near Council, Bladen County, NC, and the Edisto Research and Education Center in Blackville, SC (Fig. 1).

Results

Significant variation for yield, grade and gross revenue existed among locations and varieties. Across locations, 'Emery', 'Bailey II', 'Walton', 'N.C. 20', and 'N.C. 21' produced comparative yields, while 'Sullivan' yielded less than the other cultivars (Fig. 2). This follows the pattern observed in previous years, when 'Emery' was top cultivar for

yield and had over 50% Extra Large Kernel (ELK) percent. At the opposite side, 'Sullivan' has shown less yield. They both were released around 2014. 'Bailey II' and 'Walton' were released in 2017 and 2019 as high yielding cultivars with Sound Mature Kernel (SMK) percent in high 60's and low 70's, depending on the season. 'Bailey II' has bigger kernels than 'Walton' and matures first. 'N.C. 20' and 'N.C. 21' are recent releases by the NCSU.

Among the current lines tested in 2022, 'N18026', 'N18029', and 'N18039' are high yielding and have high ELK and SMK content. 'N18026' and 'N18029' seem to be early maturing lines, while 'N18039' requires more heat units to reach optimum digging maturity (Balota et al., 2023).

Rainout Shelter Testing

'Bailey II' and eleven breeding lines from the PVQE were tested for drought tolerance by using rainout shelters to cover the plots from end-July to end-Aug, when seed development is intense (Fig. 3). By this, information on the drought tolerance of the lines is obtained before their potential release.

Table 1 shows that, under drought in Aug, at the seed filling growth stage, yield was significantly reduced from the yield of uncovered plots and with unrestricted access to rainfall. For example, 'Bailey II' yielded 4,531 lb./A in rainfall unrestricted plots and only $1,717 lb./A under rainout shelters. The average yield of 1,863 lb./A was the Virginia State average yield in 2010, a year recording one of the most severe droughts in the recent history of the Commonwealth agriculture. Remarkably, line 'N18026' produced $4,202 lb./A under rainout shelters, just a few pounds off its yield ($4,417 lb./A) in rain unrestricted replicated plots. This line seems to have superior drought tolerance to 'Bailey II', but additional years of testing are needed to confirm the 2022 results.
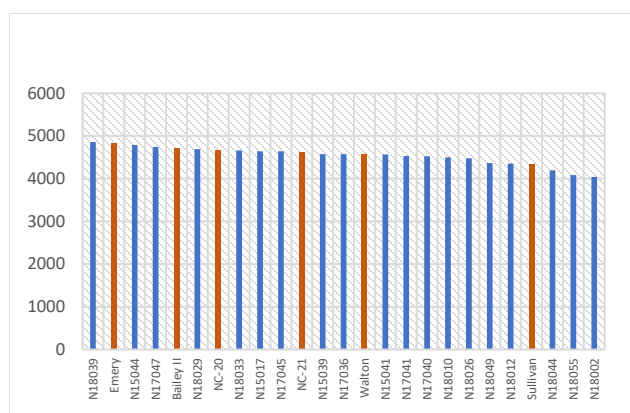

Figure 2. Yield of peanut varieties in 2022 testing.

Figure 3. Rainout plots at TAREC Research Farm after the shelters were removed in end-August 2022.

Table 1. Content of ELK, SMK and Total Kernels, and yield of 11 breeding lines and 'Bailey II'.

Variety	ELK (%)	SMK (%)	Total Kernels (%)	Yield (lb./A)
Bailey II	10 a-c	26 ab	40 ab	1717 b
N17045	10 a-c	24 ab	38 ab	1082 b
N18002	8 bc	26 ab	40 ab	2577 ab
N18010	6 bc	26 ab	40 ab	1133 b
N18012	6 bc	24 ab	40 ab	868 b
N18026	20 a	34 a	48 a	4202 a
N18029	16 ab	32 a	46 ab	1432 b
N18033	4 c	14 b	34 b	1589 b
N18039	8 bc	26 ab	40 ab	907 b
N18044	10 a-c	28 a	40 ab	1972 ab
N18049	12 a-c	30 a	46 ab	2423 ab
N18055	14 a-c	32 a	46 ab	2451 ab
Mean	**10**	**27**	**42**	**1863**

*Numbers followed by the same letter are not statistically significant

Summary

Peanut is a "cash" commodity for Virginians but, also, requires high production costs for high net

returns. Choosing a cultivar with high yield and grade potential, and adapted to environmental constrains will ensure the cropping system sustainability for farmers. Varieties tested in PVQE across the VC region include promising selections for release as future cultivars with competitive market attributes.

References

Balota, M., Cherry, F., Anco, D., and Dunne, J. 2023. [Peanut Variety and Quality Evaluation 2022 I. Agronomic and Grade Data | VCE Publications | Virginia Tech (vt.edu)](#).

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