



# Field performance of three recent high-oleic peanut cultivars released for production in the Southwestern U.S.

K.D. CHAMBERLIN\* and R.S. BENNETT, Wheat, Peanut and other Field Crops Research Unit, 1301 N. Western, Stillwater, OK 74075; J. P. DAMICONE, Department of Entomology and Plant Pathology, Oklahoma State University, Stillwater, OK 74078-1056.



## ABSTRACT

The fatty acid composition of peanuts has become increasingly important with the realization that oleic acid content significantly affects the development of rancidity. It has been determined that a high O/L in peanut results in an increased shelf life (up to 10 times) and improved flavor when compared to a normal O/L ratio. Furthermore, food products containing these high oleic oils have been shown to be nutritionally beneficial. For these and other reasons, the peanut industry demands high oleic peanuts. Peanut cultivars grown in the Southwestern U.S. are predominately high-oleic. However, only marginal resistance to yield reducing diseases such as Sclerotinia blight and pod rot complex have been reported for those high-oleic cultivars available for production. The recent releases of OLé (spanish-type), VENUS (virginia-type), and Lariat (runner-type) now offer producers disease-resistant, high-oleic peanut cultivars in three market-types. Results from Oklahoma field trials conducted in three locations for 5 years indicate that compared to other high-oleic cultivars grown in the same region, OLé, VENUS and Lariat all demonstrate a significant reduction in Sclerotinia blight incidence under high-disease pressure (66%, 61% and 55% less, respectively). All three cultivars also demonstrate a significant increase in pod rot complex resistance compared to other high-oleic cultivars of their respective market-type. Production of any of these three cultivars under conditions of high-disease pressure in the Southwestern U.S. will increase profit margins by a projected \$100-\$200/acre for peanut producers by reducing pesticide applications needed for disease management.

## INTRODUCTION

Fungal pathogens that infect peanut are numerous and their control is costly to the producers in every growing region. Sclerotinia blight (causal agent *Sclerotinia minor* Jagger) is prevalent in the Southwest production region (Oklahoma and Texas) as well as in the Virginia-Carolinas (VC), and can result in 50% loss in yield when infestations are severe. Producers are forced to spend \$150-\$200/acre annually to manage the disease.

Producers have experienced some relief due to release of varieties with some Sclerotinia blight resistance. Cultivars with partial resistance developed for optimal production in Oklahoma and Texas include the runners Red River Runner (Melouk et al., 2012) and Tamrun OL11 (Baring et al., 2013). Isleib et al. (2011), recently released Bailey, a virginia-type cultivar optimized for production in the VC region, which claims partial resistance to 5 fungal diseases, including Sclerotinia blight. However, Bailey does not stand up to Sclerotinia blight pressure in the Southwestern U.S., and producers still must apply fungicide 2-3 times during the growing season to ensure a profitable investment return. Thus, virginia peanut producers in the southwestern U.S. still plant Jupiter, a susceptible virginia cultivar with normal oleic acid chemistry released in 2000 by the Oklahoma Agricultural Experiment Station (OAES). Sustainable peanut production demands improvement over currently available levels of Sclerotinia blight resistance. In general spanish peanut cultivars are the most resistant to Sclerotinia blight among all market-types.

In the last three years, new releases with increased resistance and exceptional agronomic performance have enabled producers to grow peanuts on land know to be infested with *Sclerotinia minor*, without greatly increasing their input costs. The production of OLé (spanish), VENUS (virginia) or Lariat (runner) will increase producers profit margins by eliminating multiple applications of fungicide to manage Sclerotinia blight.

## BREEDING HISTORY

OLé (Chamberlin et al., 2015) is a high-oleic spanish-type (*Arachis hypogaea* L. subsp. *fastigiata* var. *vulgaris*) that was cooperatively released by the USDA-ARS and OAES in 2014. OLé is the product of the cross 'Tamspan 90' X F435. VENUS (Chamberlin et al., in press) is a large-seeded high-oleic virginia-type peanut (*Arachis hypogaea* L. subsp. *hypogaea* var. *hypogaea*), the first high-oleic virginia peanut developed for optimal performance in the Southwestern U.S. VENUS is the result of a cross between the cultivar Jupiter (OAES, 2000) and ARSOK-R2, a high-oleic advanced runner breeding line with resistance to Sclerotinia blight. Lariat is a high-oleic runner-type peanut (*Arachis hypogaea* L. subsp. *hypogaea* var. *hypogaea*; Chamberlin et al., in preparation) is the result of a cross between the cultivar Red River Runner and U.S. germplasm collection PI 274193, an accession identified by Damicone et al. (2009), as having a prostrate growth habit and excellent resistance to Sclerotinia blight, web blotch and pepper spot.

## FIELD PERFORMANCE METHODS AND RESULTS

All Oklahoma Variety Trials were conducted under an extensive pest management program as previously reported (Chamberlin et al., 2013-2015). The objective was to prevent as much outside influence from pest pressures (weed, disease and insect) on yield and grade as possible. The interaction between variety and location was significant so the results were separated by location. Since the varieties and advanced lines response differed by location, growers may find the data for the county closest to their location to be the most useful in selecting a variety or varieties to grow. For disease trials, market types were grown and evaluated separately, and all advanced breeding lines were high oleic. Trials were conducted as previously reported (Bennett et al., 2013-2015).

Table 1 shows peanut yields and grades averaged across years (2013-2015) and all locations in Oklahoma, along with estimated revenue for each entry. The top performing runner entry over-all was Lariat, averaging 5259 lbs/A and a grade of 74% TSMK. The revenue values reported do not take in to account cost/acre for fungicide control of Sclerotinia blight. Incidence of Sclerotinia blight and pod rot in Lariat (Table 2) was 66% and 71% less, respectively, than in Red River Runner, a moderately-resistant runner cultivar currently grown in the southwestern U.S. In other tests (data not shown), Lariat was the only cultivar tested that did not display a yield boost upon fungicide application and therefore does not require it for Sclerotinia blight management.

Over the years, there were no differences between the performance of cultivars OLé and Tamnut OL06 (Tables 1 and 2). That fact becomes relevant when considering the needs of the peanut industry with regards to spanish peanuts. Tamnut OL06 is a large-seeded spanish with a high percentage of ELKs (extra-large kernels), where as OLé seed is smaller, more uniform, and more like the typical spanish peanut desired by candy manufacturers. The release of OLé filled a void in the peanut industry created by the declining performance of OLin (the first high-oleic spanish cultivar) and the release of Tamnut OL06 and the saturation of the spanish market with ELKs.

Virginia peanut production has steadily increased in the southwestern U.S. but has consisted mainly of the cultivar Jupiter which is not high-oleic. Jupiter and high-oleic virginia-types developed in the southeast (such as Florida Fancy, Tillman et al., 2007) and Virginia-Carolina regions, are very susceptible to Sclerotinia blight and pod rot. In past years, virginia peanut production in the southwestern U.S. was limited due to the high percentage of fields infested with fungal pathogens. Incidence of Sclerotinia blight and pod rot in VENUS was 50% and 64% less, respectively, than in Florida Fancy. In other tests, VENUS averaged 61% less Sclerotinia blight and 70% less pod rot than did Jupiter (data not shown). The release of VENUS has provided peanut producers in Oklahoma and Texas with a virginia cultivar that can withstand fungal disease pressure and still produce a profitable crop.

Host-plant resistance to disease remains the most sustainable solution to pest management in crop production. The production of OLé, Lariat, and VENUS in the southwestern U.S. will reduce input costs of peanut production by reducing necessary fungicide application.

Table 1. Results from Oklahoma Peanut Variety Trials. Peanut yields and grades averaged over years (2013-2015) and across all locations (Caddo, Custer/Blaine, Beckham and Tillman counties) along with estimated revenue.

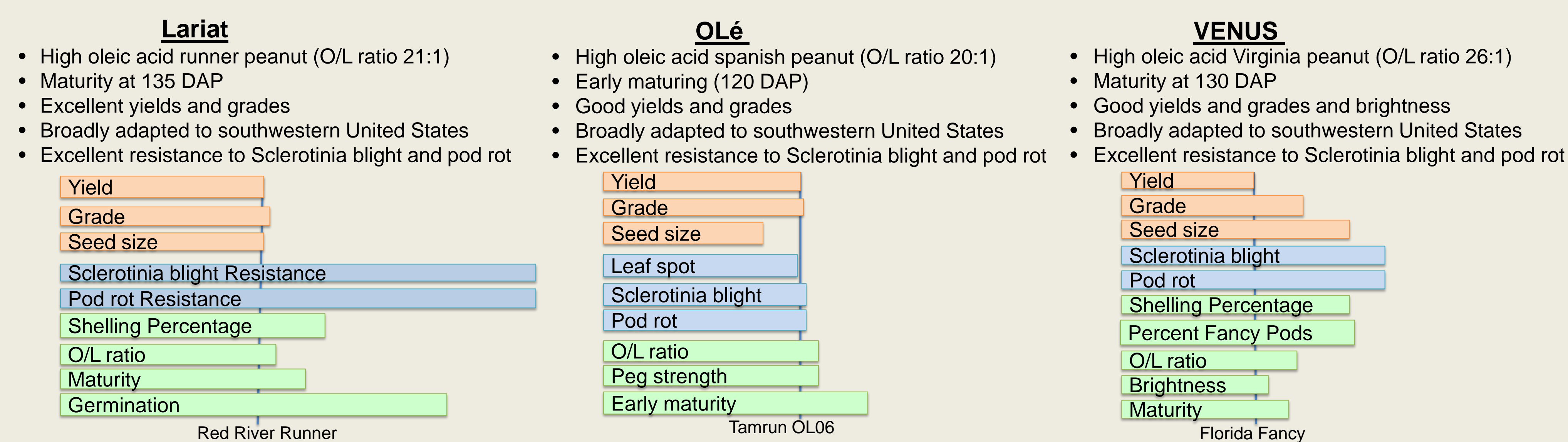
Variety or Line	Yield (lbs/A)	Grade <sup>2</sup> (%TSMK)	Revenue (\$/A)
---3 yr avg---			
<b>Runner<sup>1</sup></b>			
Lariat	5259a	74a	751
Flavor Runner 458	4259c	72b	592
Red River Runner	4898ab	74a	699
Mean	4840	72	
LSD (0.05)	418	1.4	
<b>Spanish<sup>1</sup></b>			
OLé	4157	71	546
Tamnut OL06	4129	70	534
Mean	4180	70.2	
LSD (.05)	ns	ns	
<b>Virginia<sup>1,4</sup></b>			
---2 yr avg---			
Florida Fancy	5136	70b	701
VENUS	4691	71b	649
Mean	4904	72	
LSD (.05)	ns	2	

<sup>1</sup>Market Type; <sup>2</sup>% TSMK = Percent total sound mature kernels; <sup>3</sup>Calculated based on peanut market-type price December 2015 (USDA-FSA); <sup>4</sup>Data not shown for all varieties tested in 2013 and used to calculate mean and LSD. <sup>5</sup>Values within the same column followed by the same letter are not significantly different at P = .01; ns = not significantly different

Table 2. Yield, grade and shelling characteristics along with disease incidence (Sclerotinia blight, SM) of advanced breeding lines and cultivars at the OAES Caddo Research Station, Ft. Cobb, OK (2015). Pod Rot (PR) ratings taken in Custer County Oklahoma Variety Trial 2015.

Entry	Revenue (\$/A) <sup>b</sup>	Yield (lbs/A)	Grade %TSMK	Fancy Pods (%)	100-Seed (g)	ELK (%)	SM (%)	PR (%)
<b>Runner<sup>a</sup></b>								
Lariat	696ab	4296a-c	71bc	-	73.8ab	33d	1.3	0.8b
Red River Runner	747a	4683a	74ab	-	74.9ab	49a-c	3.8	2.8b
Flavor Runner 458	513dc	3557dc	67c	-	61.0cd	42a	15.4	12.3a
<b>Spanish</b>								
OLé	595	4343	74a	-	52.3	39	0	1.8
Tamrun OL06	585	4525	70b	-	56.2	55	0	1.8
<b>Virginia</b>								
VENUS	588bc	3641c	74a	90	93.3ab	57a	2.1	5.8b
Florida Fancy	659b	4477ab	67d	84	87.7ab	42b	4.2	16.3a

<sup>a</sup> Market types analyzed separately, values followed by the same letter within the same column for each market type are not significantly different at  $\alpha=0.05$ ; <sup>b</sup> Based on loan rate for 2015.



UID: 101568



Mention of trade names or commercial products in this article is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture. USDA is an equal opportunity provider and employer. Seed requests for research purposes should be addressed to Dr. Kelly Chamberlin (kelly.chamberlin@ars.usda.gov). Other seed requests should be directed to Jeff Wright of Oklahoma Foundation Seed Services (jeff.wright@okstate.edu). References available upon request.