

Jaloro



A New Multiple Virus Resistant Hot Yellow Jalapeño Pepper

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'JALORO' - A NEW MULTIPLE VIRUS RESISTANT HOT YELLOW JALAPEÑO PEPPER

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Hot yellow wax pepper, one of about 25 different types of cultivated peppers (*Capsicum annuum* L.), is gaining in popularity as the demand for pungent peppers increases. Pungent capsicums are now considered the primary spice ingredient in the world. The bright, yellow fruits attract consumer attention. Additionally, they are known for their exceptional flavor, aroma, pungency (capsaicin), high concentrations of vitamins C and A, aesthetic value, and low caloric value. As with jalapeños, yellow wax peppers are pickled whole, sliced, diced, cut into rings, and are used in salads, sauces, and dips to add flavor and aroma to the North American diet with its increasing demand for Mexican-style cooking.

'Jaloro' is the first yellow jalapeño pepper variety developed. Its combined attributes of being bright yellow and of having the novel jalapeño shape and the multiple virus resistant traits give it market appeal.

Production Trends

The popularity of and market for fresh and pickling hot and sweet yellow wax peppers continue to increase. Yellow wax peppers represent about a \$200-million industry at the manufacturer level. Total production area of these peppers in Texas is unknown because these figures are not gathered by the Texas Department of Agriculture. Because of strong competition and high value of the crop (2.5 times more valuable than bell peppers), producers are reluctant to divulge area, production, or dollar figures on these or on any hot pepper produced for fresh

market or processing. Yellow wax peppers are grown in most areas where bell peppers are grown.

Estimated production costs per hectare for any pepper type are currently about \$2,500 in the Lower Rio Grande Valley and about \$1,300 in the Lubbock-Hereford area. High costs in the Lower Rio Grande Valley are due to excessive use of agricultural chemicals for control of insects, diseases, and weeds. Harvesting cost is an additional \$2,500 per hectare for small-fruited peppers such as jalapeños and yellow types.

Increased demand for yellow wax pungent peppers places Texas in a favorable position to meet industry needs, especially with the release of new insect and disease resistant varieties such as 'Jaloro'. Domestic production in Texas includes the Lower Rio Grande Valley of South Texas (two growing seasons per year), the Winter Garden area from San Antonio to Crystal City (two overlapping seasons), the Texas Panhandle, the Trans-Pecos, and the El Paso area. In most of these areas, the requirements of labor, transportation, processing facilities, and market conditions are readily available for the fresh market and processors. Peppers can be harvested for 8 months during the year in Texas without much competition from other U.S. pepper-growing areas.

Commercially available yellow wax pepper cultivars were developed for other areas with more favorable growing conditions and lacking heavy pressure from insects and diseases. The effects of a complex of insects, diseases, and unfavorable environment are reflected in low yields in some temperate and subtropical regions of Texas such as the Lower Rio Grande Valley of South Texas.

All commercial yellow wax pepper cultivars are susceptible to tobacco etch virus (TEV), potato virus Y (PVY), pepper mottle virus (PeMV), tobacco ringspot virus (TRSV), cucumber mosaic virus (CMV), and Texas pepper gemini virus (TPGV). Some yellow types exhibit a local lesion resistance reaction when challenged with tobacco mosaic virus (TMV). All these viruses represent the Valley Mosaic Complex. 'TAM Mild Jalapeño-1' and 'TAM Veracruz' were developed to meet these industry needs for multiple virus resistance. The need, however, still existed for a tropically adapted pungent yellow wax jalapeño pepper suited for South Texas and other areas.

'Jaloro' was developed by the Texas Agricultural Experiment Station at Weslaco to meet these needs. It is a yellow, pungent, multiple virus resistant (TEV, PVY, PeMV, TRSV, TMV, and CMV), machine-harvestable jalapeño pepper, ideally suited for growing in most regions of Texas.

'Jaloro' is intended for the fresh market and the processing industry (pickling and picante sauces).

KEYWORDS: *Capsicum annuum*, virus resistance, vegetable breeding.

A summary of varietal information reported in this bulletin is published in Texas Agricultural Experiment Station Leaflet 2466, which can be obtained from Texas Foundation Seed, Texas Agricultural Experiment Station, College Station, TX 77843-2581 (phone: 409/845-4051).

History

The Weslaco pepper-breeding program began in December 1970. All the previously mentioned viruses were detected and identified on peppers and other vegetable crops throughout the Valley. Fifteen different pepper genotypes (pungent and nonpungent) having heritable levels of resistance to some of these viruses were initially identified. At the seedling stage, all seedlings were mechanically inoculated with a known viral suspension, and seeds were harvested from hand-pollinated, viral resistant (VR) plants.

Plants resistant to local isolates of TEV, PVY, and TMV were found in AC2207, a small, 3- to 4-cm, pungent serrano-type pepper native to Mexico (obtained from Paul Smith, professor emeritus, University of California at Davis). Resistance to these same viruses was found in segregating line PI264280, a pungent, small pimiento type also obtained from Paul Smith.

Hybridization of PI 264280 x AC2207 in 1971 resulted in segregating VR progeny, designated TAES 71136. This is one of several family series that served as the wide genetic base for most of the multiple virus resistant plants in the Texas pepper-breeding program. Heritable resistance to this virus complex, including PeMV, was found in progeny from hybridization in 1973 of TAES 71136 x Jalapeño 1158 (unknown origin). In addition, VR jalapeño fruit types were crossed to Jalapeño L (PetoSeed Co.) in 1976 to amplify the long jalapeño genes. The resulting TAES 76064 VR lines were crossed in 1981 to 'Caloro' (a small, yellow wax pepper developed by Paul Smith) to add the genes for yellow color, flavor, aroma, pungency, earliness, and prolificness, and to amplify TM resistance.

A series of individual plant selections of yellow wax, VR, pungent, jalapeño types through the F_6 yielded the desired yellow wax jalapeño type. An individual F_6 yellow

jalapeño-fruited plant was selected, selfed, and increased under isolation with repeated viral inoculations. Resistance to CMV, TRSV, and a Florida isolate of tomato mosaic virus (ToMV) was found during these screenings. Seeds from the best virus-symptomless plants were bulked. Final pedigree designation was TAES YJ81032, and it became the progenitor of 'Jaloro'. This is a novel pepper, unknown in the pepper fresh market or in the processing industry.

Description

Important horticultural characteristics of 'Jaloro' are compared with 'Rio Grande Gold-Sweet' (RGG) and 'TAM Veracruz' (TVC) in Table 1. 'Santa Fe Grande' (SFG) hot is probably the most popular of the small, yellow wax-type peppers. It is similar to sweet RGG. TVC is probably the most popular of the hot jalapeño peppers.

'Jaloro', a hot yellow jalapeño, is a novelty item in the hot pepper industry. 'Jaloro' grows between 40 and 50 cm tall, depending on cultural practices and growing environment, and is slightly shorter and more compact than TVC but taller and slightly more open than RGG or SFG. A strong main stem and sturdy branches can support a heavy set of large yellow jalapeño-type fruit. The medium-size leaves offer ample cover to protect fruit from sunburn scald yet allow transmission of enough sunlight for rapid color development of bright yellow fruit. Fruit are more resistant to sunburn than are regular bell peppers. 'Jaloro' sets concentrated fruit with thick walls similar to TVC but is slightly more pungent. The bright-yellow pungent fruit exhibit a few fine epidermal cuticular cracks to indicate full maturity and strong jalapeño flavor and aroma associated with jalapeño peppers. The ripe yellow fruit are well suited either for fresh market consumption or for processed foods (pickled whole, sliced, or diced for picante sauce). The

matured red fruit also can be used fresh, processed, or dehydrated to a powdered form.

Performance

'Jaloro' seeds are smaller and lighter than bell or chile pepper seeds. These light-tan seeds are approximately 6.1 grams per 1,000 seeds, or about 165 seeds per gram. They resemble jalapeño seeds. These seeds do not possess the thick cuticle or epidermal hairs associated with tomato seeds and thus can be easily sterilized on the surface to remove pathogenic fungi, bacteria, and/or virus particles. Germination of viable seed occurs in 6 days at 30°C.

After expansion of primary leaves, the tap root system may penetrate to a depth of 20 cm in 30 days, but only if seedlings are moisture stressed for 20 days after cotyledon emergence. Large root systems increase stem diameter, length, and strength of foliage. Such systems produce greater aerial biomass, thus allowing earlier (5 to 10 days) harvest. Extensive root systems also foster rapid fruit development and thus reduce risk of sun scalding of fruit late in the season and wilt of plant and foliage during hot afternoons. The elimination of one or two irrigations reduces production costs and offers control or reduction of Phytophthora wilt.

For highest possible yields of high-quality fruit, 'Jaloro' should be direct-seed planted (16 to 23 kg/ha) on 0.76-m single-row beds, spacing plants 20 cm apart. The seeds can also be planted on double rows, 30 cm apart on a bed, or direct-seeded on 1.02-m beds, spaced 30 cm on the rows.

Extensive trials with 'Jaloro' throughout Texas, New Mexico, and California indicated that this pepper is adaptable to most areas. It out-yielded all other cultivars most of the time (Tables 2 to 9) and attracted the attention of several major fresh market producers, pickling pepper processors, and seed producers.

Table 1. Botanical and horticultural characteristics of 'Jaloro' compared with 'Rio Grande Gold-Sweet' and 'TAM Veracruz Jalapeño'.

	Jaloro	Rio Grande Gold-Sweet	TAM Veracruz
Botanical			
Plant			
Height (cm)	40-50	33-41	50-70
Branching	Multibasal, prostrate	Multibasal, prostrate	Semi-compact, single stem
Foliage			
Size (cm)	Thick, dense 10.5 x 5.0	Thick, dense 10.2 x 4.9	Thick, dense 10.5 x 5.3
Conformation	Semi-compact, dense	Compact, dense	Semi-compact, dense
Color	Medium dark to light green	Light green	Medium to dark green
Horticultural			
Fruit			
Relative days to maturity	75	75	75
Size L x W (cm)	5.4 x 2.8	6.0 x 3.4	5.9 x 2.7
Conformation	3-4 celled, conical, cylindrical, blunt end	3 celled, conical	3-4 celled, conical, cylindrical, blunt end
Attachment	Pendent	Pendent, semi-pendent	Pendent
Epidermis	Smooth, semi-waxy, small cracks, some desirable	Smooth, waxy	Semi-smooth, cracks 30%-40% desirable
Color	Bright yellow to red mature	Yellow to mature red	Dark green to red
Habit	Concentrated, uniform maturity	Concentrated, uniform maturity	Concentrated, semi-uniform
Wall thickness (mm)	4.13	3.34	3.90
Locule no.	3-4	3 mainly	3-4
Uses	Market, processing, picante sauces, ring slices	Market, processing sauces and pickling, ornamental	Fresh, nacho ring slices, picante sauce
Pungency			
Capsaicin (ppm)	5,000	0	4,000
Scoville units ¹	26,000	0	24,000
Pungency rating ²	8-9	1	7-9
Virus resistance			
South Texas strains	TEV, PeMV, PVY, TMV, TRSV, CMV	TEV, PeMV, PVY, TMV, TRSV, CMV	TEV, PeMV, PVY, TMY, TRSV, CMV
Remarks			
	Multipurpose use, prolific, high yielding	Prolific, high yielding	Prolific, early, high yielding, skin cracks, fruit slightly variable

¹ Capsaicin: Quantified by high-pressure liquid chromatography and converted to Scovill heat units, Cal-Compack Foods, Santa Ana, CA.

² Pungency rating: 1 = nonpungent, 5 = mild, 10 = super hot.

Limitations

Information in this document is the result of Texas Agricultural Experiment Station trials. These results may vary under individual cultural practices and growing conditions. It should be recognized that the disease and/or insect resistance/tolerance of all varieties is verified by

standard testing under laboratory conditions. The degree of resistance/tolerance will vary depending upon many factors including environmental conditions, aggressiveness of the pathogen/insect, presence of new strains or races of pathogen/insect, etc., in the field.

Availability

At the time of this writing, 'Jaloro' will be released as an exclusive license to a major seed producer to ensure genetic stability. Application for plant variety protection will be filed with the Plant Variety Protection Office of the U. S. Department of Agriculture.



Acknowledgments

Much evaluation of this new pepper variety was done by Frank J. Dainello, associate professor, Texas A&M University Agricultural Research and Extension Center at Uvalde (currently, Extension horticulturist - Vegetables, Department of Horticultural Sciences, Texas A&M University, College Station); and by David A. Bender, associate professor, Texas A&M University Agricultural Research and Extension Center at Lubbock.

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Table 2. Comparative performance test of 'Jaloro' compared with other jalapeños, spring 1987, Munday, Texas.

Entry	Yield (mt/ha)	TEV rating	Pungency rating
Jaloro	32.00 a ¹	9 ²	8 ³
TAM MILD Jalapeño-1	25.60 b	9	6
Jalapeño-M	24.60 b	1	8
TAM Veracruz	16.70 c	9	7

¹ Means represent average of six harvests from 2.13-m plots, 30-cm plant spacing, four replications, separated by Duncan's Multiple Range Test, 5% level.

² Virus rating: 9 = very resistant, 1 = very susceptible.

³ Pungency rating: 10 = super hot, 5 = mild, 1 = nonpungent.

Table 3. Comparative performance test of 'Jaloro' compared with other jalapeños, fall 1988, Munday, Texas.

Entry	Yield (mt/ha)	TEV rating	Pungency rating
Jaloro	19.70 a ¹	9 ²	7 ³
TAM Mild Jalapeño-1	11.00 b	9	8
TAM Veracruz	10.40 b	1	8
Jalapeño-M	8.70 c	9	4

¹ Means represent average of six harvests from 3.05-m plots, 30-cm plant spacing, with four replications separated by Duncan's Multiple Range Test, 5% level.

² Virus rating: 9 = very resistant, 1 = very susceptible.

³ Pungency rating: 10 = super hot, 5 = mild, 1 = nonpungent.

Table 4. Comparative performance test of 'Jaloro' compared with other jalapeños, fall 1989, Donna, Texas.

Entry	Yield (mt/ha)	Fruit			
		Pungency (1-10)	Length (cm)	Width (cm)	Wall thickness (mm)
Jaloro	38.11 a ¹	8 ²	5.27 c	2.60 b	3.57 c
TAM Veracruz	37.30 a	8	7.50 a	2.85 a	4.50 a
TAM Mild Jalapeño-1	32.77 b	2	5.75 b	2.50 b	4.20 b

¹ Means represent average of two harvests from 1.5-m plots, 15-cm plant spacing, with four replications separated by Duncan's Multiple Range Test, 5% level.

² Pungency rating: 10 = super hot, 5 = mild, 1 = nonpungent.

Table 5. Comparative performance test of 'Jaloro' compared with other jalapeños, fall 1989, La Feria, Texas.

Entry	Yield (mt/ha)	Fruit			
		Pungency (1-10)	Length (cm)	Width (cm)	Wall thickness (mm)
TAM Mild Jalapeño-1	22.83 a ¹	3 ²	5.35 bc	2.53 b	3.45 b
Jaloro	20.61 ab	7	5.70 b	2.93 a	4.13 a
TAM Veracruz	20.37 ab	8	6.78 a	3.25 a	4.23 a
SJ79053 _{F15}	15.22 b	1	6.80 a	3.23 a	3.53 b

¹ Means represent average of two harvests from 1.52-m plots, 15-cm spacing, with four replications separated by Duncan's Multiple Range Test, 5% level.

² Pungency rating: 10 = super hot, 5 = mild, 1 = nonpungent.

Table 6. Comparative performance test of 'Jaloro' compared with other jalapeños, fall 1989, Rio Grande City, Texas.

Entry	Yield (mt/ha)	g/plant	Fruit			Pungency
			Length (cm)	Width (cm)	Wall (mm)	
Jaloro	12.1 a ¹	479.8 a	5.22 c	2.80 a	4.69 a	8 ²
TAM Veracruz	4.5 b	225.5 b	7.68 a	2.85 a	4.83 a	7
Jalapeño-M	2.4 b	114.4 b	6.32 b	2.49 b	3.95 b	8

¹ Means represent average of once-over harvest from 15.2-m plots, 30-cm plant spacing, with four replications, separated by Duncan's Multiple Range Test, 5% level.

² Pungency rating: 10 = super hot, 5 = mild, 1 = nonpungent.

Table 7. Comparative performance test of 'Jaloro' compared with other jalapeños, spring 1990, TAES-Weslaco, Texas.

Entry	Yield (mt/ha)	TEV rating	Pungency rating	Hot set rating
TAM Veracruz	13.92 a ¹	9 ²	7 ³	8 ⁴
Jaloro	12.54 a	9	8	8
Mitla (Hybrid)	4.35 b	1	8	1
TAM Mild Jalapeño	4.32 b	9	3	10 ⁴
Early Jalapeño	3.27 b	1	8	6
Jalapeño-M	2.67 b	1	7	6
Jalapa (Hybrid)	2.16 b	1	8	6

¹ Means represent averages of once-over harvest from 1.52-m plots, 15-cm spacing, with four replications separated by Duncan's Multiple Range Test, 5% level.

² Virus rating: 10 = very resistant, 1 = very susceptible.

³ Pungency rating: 10 = super hot, 5 = mild, 1 = nonpungent.

⁴ Hot set rating: 10 = 60% or more flowers, 1 = no flowers.

Table 8. Comparative performance test of 'Jaloro' compared with other jalapeños, 1990, Uvalde, Texas.

Entry	Yield (mt/ha)	Pods/plant g/pod	Fruit		
			Pod (#)	length (cm)	Stand (%)
TAES Jumbo Jalapeño Type	11.87	17.4	17.9	4.4	100.0
Jaloro	11.61	10.8	29.4	3.1	97.5
TAM Veracruz	10.38	15.5	17.4	4.1	100.0
Jumbo Peto	9.88	30.4	8.5	4.2	95.0
Jalapeño-M	6.18	10.6	13.6	3.5	98.8
LSD (P = 0.05)	ns	3.5	ns	ns	8.6

Table 9. Comparative performance test of 'Jaloro' compared with other types, 1991, Uvalde, Texas.

Entry	Yield ¹ (mt/ha)	Fruit	
		Pods/plant (#)	Pod length (cm)
Jaloro	13.53	33	4.3
TAM Veracruz	9.87	14	5.8
Jalapeño-M	2.04	5	4.6
Santa Fe Grande (Yellow)	0.87	2	4.6
LSD (P = 0.05)	1.40	2	0.5

¹ Yield based on three harvests.

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