

'Kewalo' Tomato¹

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Resistance to bacterial wilt (*Pseudomonas solanacearum* E. F. Sm.) in large-fruited tomato (*Lycopersicon esculentum* Mill.) has been difficult to combine with both earlier maturity and high levels of resistance in commercial type cultivars. The use of F₁ hybrids to improve vigor, yields, maturity time and to add multiple disease resistance has not been a commercial practice in large-fruited, bacterial-wilt resistant tomatoes apparently due to a lack of suitable parents. Resistance to this disease is largely recessive (1) and both parents would need to be resistant to some degree. The possibilities of extending resistance to several strains of bacterial wilt of tomatoes in various geographic areas by use of F₁ hybrids from parents resistant to different strains has not been widely tested. Recent field trials in Hawaii with 19 bacterial wilt resistant hybrids using 'Kewalo' as one parent and wilt resistant lines from other areas as the other parent showed no cases in which the F₁ failed to live longer and produce more than both parents. This could be due, in part, to resistance to several other diseases (4) in the hybrid. Some of these parents ('Venus', 'Saturn') have survived better in field tests elsewhere than in Hawaii (personal correspondence). 'Kewalo' is being released as a parental stock to make multiple resistant F₁ hybrids having bacterial wilt resistance in both parents, since the other lines generally lack the dominant genes for multiple resistance now available in 'Kewalo'.

Origin

Lycopersicon pimpinellifolium (Jusl.) Mill. P. I. 127805A was selected in 9 generations for field resistance to bacterial wilt on Oahu to produce sel. 5808-2. This was crossed with the Hawaii cultivar, 'Anahu' and backcrossed twice, using 'Anahu' and its derivative, 'Kalohi', as a source of large fruit and multiple resistance. Selfed selections between back crosses were made over a 15 year period with tests in nurseries and in fields infested with bacterial wilt, root knot nematode, (*Meloidogyne incognita* (Kofoid & White) chitwood), Fusarium Wilt (race 1), Spotted Wilt virus, *Stemphylium solani* Weber, *Rhizoctonia solani* Kuehn and red spider mites, (*Tetranychus telarius* (L.)) Selection 7959 ('Kewalo')

was made after 7 generations following the last backcross (Fig. 1). In each field trial selections were made only when adjacent control plants, (yellow plum) died from bacterial wilt prior to fruit set (Fig. 2).

Description

'Kewalo' is essentially a bacterial wilt resistant conversion of the 'Anahu' tomato, with similar vine and fruit type. 'Kewalo' has the gene combination *sp u I Sw^a Sm Mi* plus bacterial wilt resistance at moderate temp (below 27°C). 27°C).

Outstanding characteristics and uses

Fruits of the *L. pimpinellifolium* source of resistance had a sweeter flavor than any bacterial wilt accession observed here. No bitter, alkaloid flavors in the fruits of lines derived from 'Anahu' × 5808 crosses have ever been found. This is sometimes a problem in bacterial wilt resistant lines (3). A high alkaloid (tomatine) content appears characteristic of roots of bacterial wilt resistant tomatoes (6) with some lines allowing this alkaloid to affect the fruit flavor. 'Kewalo' and all its F₁ hybrids observed to date have been free of such alkaloid flavors. The type of bacterial wilt resistance in 'Kewalo' is more

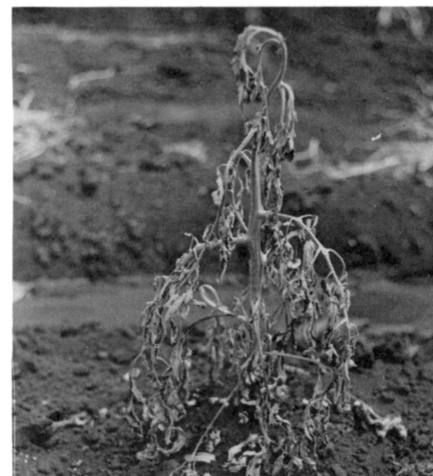


Fig. 2. 'Yellow plum' showing effects of bacterial wilt, Poamoho Farm, Oahu. These yellow-fruited control plants plainly indicate any field areas where bacterial wilt is weak or absent.

effective when field temp do not exceed 27°C (4). The range of adaptation of 'Kewalo' hybrids has not been fully determined. 'Kewalo' itself could be used in cooler seasons or intermediate elevations in the tropics. Multiple disease resistance in 'Kewalo' also includes *Fusarium* wilt, race 1, common races of southern root knot nematodes. Spotted wilt virus in Hawaii (gene *Sw^a*) and *Stemphylium solani* as well as resistance to red spider mites (4). Other 'Anahu' characters found in 'Kewalo' include tolerance to low phosphate



Fig. 1. Fruit size improvement in bacterial wilt resistant tomatoes: *L. pimpinellifolium* source of resistance (left); 'Kewalo' fruits and vine (center), Poamoho Farm, Oahu.

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soils, prolific fruit set, medium maturity, determinate plant habit and uniform ripening immature green fruit (uu). It was not selected for processing-type fruit quality as Hawaii has no tomato processing industry.

The use of 'Kewalo' as a parent in making F₁ hybrids with other bacterial wilt resistant lines is suggested in part by its 'Anahu' ancestry. Hybrids made from the latter have been widely adapted in Hawaii and elsewhere in these latitudes where a combination of hybrid vigor and multiple disease resistance is needed.

'Anahu' hybrids have consistently outyielded all others in every trial at the Hawaii AES since 1959 (4, 5) and were tested in the Southern Tomato Exchange Program as STEP 314, 351, 352, 483, 484, and 537 during the same period with similar results. 'Kewalo' hybrids seen to date follow the general pattern of 'Anahu' hybrids by improving vigor, longevity, fruitfulness, and disease resistance but with little disturbance of the various horticultural characters of the other parent.

The 'Kewalo' hybrid which performed best for commercial type fruit in Hawaii was hybrid 'BWN-21' ('Kewalo' × 'Venus'). 'Saturn', 'Venus' and other bacterial wilt resistant lines susceptible to root knot do not survive well in fields here infested with both these diseases. The effect of root knot galling as interfering with the expression of resistance to bacterial wilt has been well established (2). This suggests a need for the addition of the *Mi* gene to most bacterial wilt lines or hybrids.

Availability

Seed samples of 'Kewalo' are available. Trial samples of 'Kewalo' F₁ hybrids have been sent to some overseas cooperators. Additional seed of hybrid 'BWN-21' is expected by 1975. Address inquiries to: University of Hawaii, Dept. of Horticulture, Seedsman, 3190 Maile Way, Honolulu, Hawaii 96822.

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'Great Northern Valley' Dry Bean¹

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Common blight, caused by the bacterium *Xanthomonas phaseoli* (E. F. Smith) Dowson, is one of the most serious seed-borne bacterial diseases of beans, *Phaseolus vulgaris* L. Recommended controls are use of certified disease-free seed and rotation. There is no satisfactory chemical control. Great Northern (GN) cultivars 'Tara' (2) and 'Jules' (3) have high tolerance to *X. phaseoli* and high yield but combine the disadvantages of late maturity and vigorous vines, the latter creating conditions favorable for white mold. These 2 cultivars were derived by pedigree selection from the cross of the late maturing, common blight tolerant GN Nebraska #1 sel. 27 line with the early maturing susceptible 'GN 1140'. The reaction to *X. phaseoli* was inherited quantitatively (4) while maturity was inherited qualitatively (1). Linkage occurred between genes controlling common blight tolerance and late maturity (4).

Origin

Genes controlling early maturity in 'GN 1140' were transferred using 6 backcrosses to the recurrent parent GN Nebraska #1, sel. 27. Earliness and a high level of common blight tolerance were recombined using this breeding procedure.

Description

'GN Valley' (tested as GN Expt.-M) is similar to the standard 'GN UI #59' in

plant habit, seed size, seed shape, and oven baking quality, but matures only 2 to 4 days later. Common blight tolerance of 'GN Valley' is similar to 'GN Tara' and yield is superior to 'GN UI #59' and 'GN 1140' under conditions favorable for common blight (Table 1). Yield of 'GN Valley' is comparable to standard GN cultivars in the absence or in the presence of a moderate level of this disease (unpublished data from 3 years of trials).

Outstanding characteristics and uses

'GN Valley' is considered superior to 'GN Tara' and 'GN Jules' because it matures approx a week earlier and has less vine growth. Its tolerance to *X. phaseoli* is superior to 'GN 1140' and 'GN UI #59'. The introduction of this cultivar can reduce crop losses due to disease and may permit an expansion of the bean seed industry in Nebraska.

Availability

The Nebraska Foundation Seed Division, University of Nebraska, Lincoln, Nebraska plans to produce foundation seed from 770 kg of breeder seed in 1974. Samples of seed for trial may be obtained from that source.

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Table 1. Yield, disease reaction, and no. of days to maturity of 'GN Valley' and standard cultivars 'GN 1140' and 'GN UI #59' under severe levels of common blight in 1971, 1972, Nebraska.

Cultivar	1971				1972		Disease ^z reaction	No. days to maturity
	Scottsbluff		Scottsbluff		Alliance			
	Tons/ha	(Bu/acre)	Tons/ha	(Bu/acre)	Tons/ha	(Bu/acre)		
GN Valley	3.2	(46.9 a ^y	3.6	(51.2) a	1.7	(25.7) a	Tolerant	95-97
GN 1140	2.4	(35.9) b	2.2	(33.0) b	1.5	(21.7) b	Highly susceptible	87-89
GN UI #59	2.8	(41.4) b	—	—	1.5	(21.5) b	Slightly susceptible	90-95

²Disease reaction: tolerant-slight small lesions on about 1-5% of leaves close to maturity; slightly susceptible-lesions of various sizes on most leaves and some leaves chlorotic; highly susceptible-many large lesions on most leaves, pronounced chlorosis and necrosis.

³Mean separation within columns by Duncan's multiple range test, 5% level.