

BIGHART — *Improved Variety of* PIMIENTO PEPPER

W. H. GREENLEAF, *Professor of Horticulture*
M. H. HOLLINGSWORTH, *Superintendent, North Alabama Horticulture Substation*
HUBERT HARRIS, *Associate Professor of Horticulture*
K. S. RYMAL, *Assistant Professor of Horticulture*

BIGHART IS THE NAME given to an improved pimiento pepper (*Capsicum annum* L.) variety developed at Auburn University Agricultural Experiment Station. The new pepper was released in January 1969.

Advantages of Bighart include high yields and large fruit of high quality. In 2-year trials at the North Alabama Horticulture Substation, Cullman, the new va-

riety produced 74 per cent higher yields than Truhart, the leading pimiento variety for many years. In addition, the fruits were 37 per cent heavier, had 13 per cent thicker walls, and gave 10 per cent higher recovery of canned product than fruit of Truhart. Further, the concentrated fruit set and fruit maturity of Bighart indicate potential suitability for machine harvest. Fruiting habit and fruit

AGRICULTURAL EXPERIMENT STATION

E. V. Smith, *Director*

AUBURN UNIVERSITY

Auburn, Alabama

quality are illustrated by the title photographs.

PIMIENTO VARIETY DEVELOPMENT

The first pimiento pepper variety grown in the United States was introduced into Georgia from Spain out of New World material in 1911. This sweet pepper, which had large, pointed, heart-shaped fruits with distinctive aromatic flavor, was destined to start the U.S. pimiento industry. The canned, red ripe product that was known as pimiento at the time was being imported from Spain. Today, the word pimiento refers to either the canned product or to one of several pepper varieties with pimiento type fruit derived from the original Spanish introduction.

In 1913, S. D. Riegel and Sons, of Experiment, Georgia, introduced the Perfection Pimiento variety. It was developed from a single plant with beautiful fruits selected out of the original Spanish introduction.

The Truhart Perfection variety was released by Cochran (1) in 1943. It was a bulk of several selfed plants that had been selected out of Perfection for superior yield and fruit type. Truhart Perfection is still the leading variety today.

In 1963, Dempsey (2) released the variety Truhart Perfection-D, which was derived from a cross of Truhart with the Japanese variety Santanka. However, Truhart-D has not replaced Truhart.

The nematode resistant pimiento variety Mississippi Nemaheart was released by Hare (5,6) in 1966. Its parentage involved Truhart and a hairy-leaved, root-knot nematode resistant, pungent Mexican pepper, M152B. Because Nemaheart lacked fruit size, it was not commercially acceptable even though it was nematode resistant.

The Peto Seed Company of California markets still another variety, Pimiento-L.

ORIGIN OF BIGHART PIMIENTO

Bighart is the result of a wide-cross-breeding program started by the senior

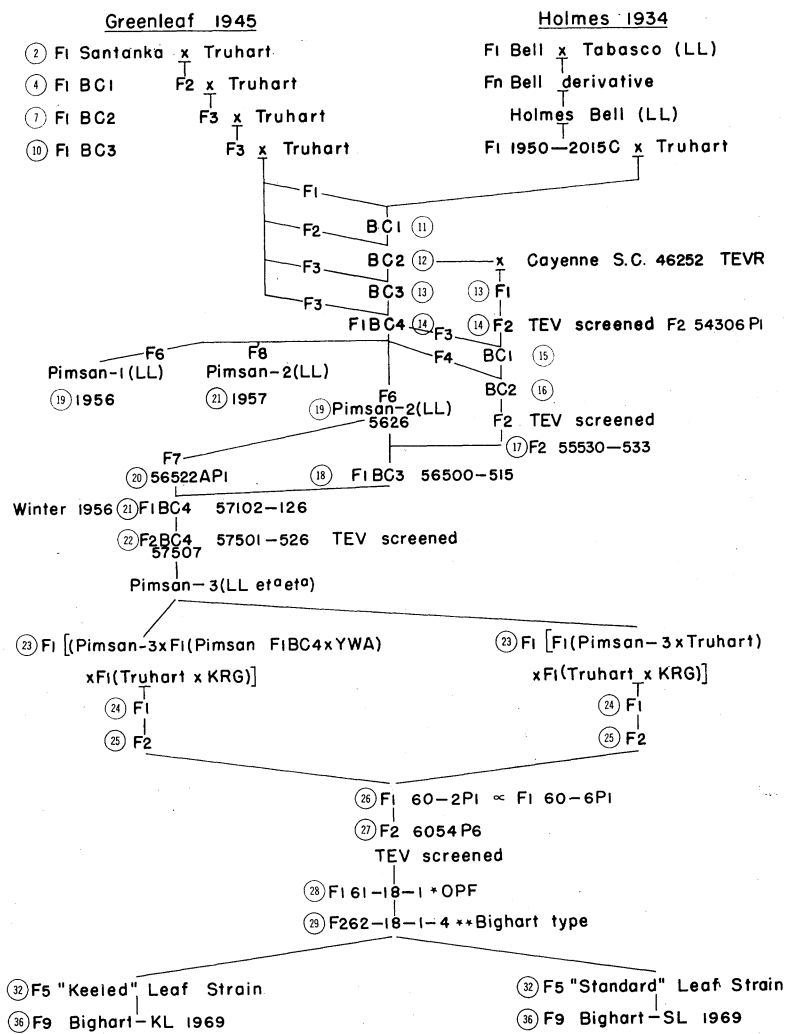
author in 1945 at the Georgia Agricultural Experiment Station. The pedigree of Bighart, shown on page 3, comprises 36 generations and includes the following pepper varieties, all of which are *Capsicum annum* L.:

1. Truhart Perfection Pimiento,
2. The bacterial leaf spot resistant, pungent, Japanese variety Santanka,
3. Holmes' tobacco mosaic virus (TMV) resistant experimental bell type, No. 1950-2015C (7),
4. The tobacco etch virus (TEV) resistant South Carolina Cayenne type, S.C. 46252 (4,9),
5. Keystone Resistant Giant Bell, and
6. Yolo Wonder-A Bell.

Three earlier experimental varieties that resulted from this breeding program were released to breeders and seedsmen during 1956-58. These were Pimsan 1, Pimsan 2, and Pimsan 3. (The name Pimsan denotes Pimiento-Santanka ancestry.) These varieties carried L-gene resistance against TMV, and Pimsan 3 also possessed TEV resistance derived from S.C. 46252. Pimsan 2 is still being maintained by the W. Attlee Burpee Seed Company.

A breakthrough in the breeding of Bighart occurred in 1962 when a superior plant with extra large, well shaped pimiento type fruits segregated in the F_2 from a near-sibcross (see pedigree). This plant has transmitted its superior characteristics through successive generations. The original F_2 plant and selections made through F_5 were selfed. Of 10 F_6 selections made in 1966, five were selfed and five open pollinated. The 29 F_7 selections made in 1967 were selfed and, from the combined seed plus some seed from certain $F_6 \times F_7$ sib-crosses, 6,000 plants were grown for seed increase at the North Alabama Horticulture Substation in 1968. Nineteen pounds of Bighart seed were saved, with 17 pounds distributed to the six member companies of the Associated Pimiento Cannery, to which the variety was released.

PEDIGREE OF BIGHART PIMIENTO



Abbreviations

- YWA = Yolo Wonder-A Bell
- KRG = Keystone Resistant Giant Bell
- * = Superior selections
- ③⑥ = Number of generations

Two Strains of Bighart Selected

Two strains of Bighart, based on leaf type and plant habit, were selected beginning with the F₅ generation. The one designated K for "Keeled" has an up-folded leaf blade with prominent midrib resembling the keel of a boat, in contrast to the flatter leaf blade of the normal "Standard" — designated S — plant type. Keeled is a true breeding recessive trait, probably monogenic. Hence, Bighart-K breeds true for "Keeled," whereas Bighart-S still segregates "Keeled" plants up to a maximum of one-sixth of the plant population.

Associated with "Keeled" is a more compact plant type and probably a more concentrated basal fruit set and maturity than "Standard" — characteristics essential for once-over harvest. The "S" strain is preferred for repeated hand harvests. Both strains are relatively well fixed genetically for earliness, concentrated maturity, and a heavy crown set of large, well shaped fruits. One strain could probably be substituted for the other, as they

are indistinguishable in fruit size, shape, and quality.

Of the 29 Bighart selections made in 1968, 16 were of the "K" and 13 of the "S" strain.

CHARACTERISTICS AND PERFORMANCE

Tobacco Mosaic Virus Resistance

Both Bighart-K and Bighart-S breed true for the L-gene that was discovered by Holmes (7) in the Tabasco pepper (*C. frutescens* L.) variety and transferred by him to *C. annum* L. No. 1950-2015C. The L-gene confers resistance equivalent to field immunity to all tobacco form strains of TMV by localizing the virus at the site of infection, thus preventing systemic spread. Unfortunately, the L-gene is ineffective against the pepper form of TMV to which no resistance has as yet been discovered (3).

Fruit Yield

Fruit yields in 1966 averaged only about one-third those of 1967, Table 1. The relative yield rank of the entries was

TABLE 1. PIMIENTO VARIETY YIELD TRIALS, NORTH ALABAMA HORTICULTURE SUBSTATION, 1966-67

Variety or line	Marketable weight	Marketable fruits	Average fruit
	per 100 plants ¹	per 100 plants ¹	weight
	<i>Lb.</i>	<i>No.</i>	<i>Lb.</i>
1966			
Nemaheart.....	13.8 cd ² d'e'	110 b c'd'	0.125 b'
Pimiento-Peto.....	16.0 cd d'e'	166 b b'c'	0.098 b'
Truhart-Pomona.....	26.3 bc c'd'	207 b b'	0.125 b'
AU-F.66-48 ³	36.5 bc b'c'	181 b b'c'	0.200 a'
Truhart-King Pharr.....	49.7 b b'	392 a a'	0.126 b'
Bighart.....	90.1 a a'	530 a a'	0.170 a'
1967			
Truhart-D.....	78.1 bc c'd'	547 b'	0.143 cd e'
Truhart-King Pharr.....	82.6 bc c'd'	394 b'	0.210 b b'
Truhart-Pomona.....	92.2 bc b'c'	513 b'	0.180 bc b'c'
AU F.67-30 ³	123.2 ab a'b'	698 a'	0.176 bc c'd'
Bighart.....	154.0 a a'	518 b'	0.297 a a'

¹ Marketable weights and marketable numbers of fruits are totals from four plots of 25 plants each, spaced 2 feet apart in rows spaced 44 inches. Three harvests were made each year. To convert these plot yields to per acre yields, multiply by 59.4.

² Values followed by different letters within a comparison differ significantly at P<0.01 for plain letters and at P<0.05 for primed letters according to Duncan's new multiple range test.

³ These two lines are earlier sister lines of Bighart from the same superior single plant selection.

similar, with Bighart outproducing the higher yielding of the two commercial Truhart strains by 81 per cent in 1966 and by 67 per cent in 1967. Bighart fruits averaged heavier than those of the heaviest Truhart strain—34 per cent heavier in 1966 and 41 per cent heavier in 1967.

Fruit Recovery

In 1966, Elonza Ward, of the King Pharr Canning Company, made a preliminary check of the recovery weights of fruit of Bighart and Truhart. About 800 pounds of fruit (one pallet box) of each variety was cored, and Bighart had 17 per cent more recovery weight than Truhart.

Fruit Quality

Laboratory tests at Auburn compared Bighart with Truhart in soluble and total solids, pH, titratable acidity, percentage of trimmed recovery, fruit wall thickness, and color of canned product. Bighart was superior in both soluble and total solids, but there were no appreciable differences in pH or in titratable acidity, Table 2. Average recovery percentage of five Bighart lines exceeded the average of three Truhart strains by 12.1 per cent, Table 3. The highest recovery in line No. 12 exceeded that of the highest Truhart (Pomona) strain by 10.0 per cent.

The 12.1 per cent average gain in trimmed recovery from Bighart reflects

TABLE 2. PIMIENTO VARIETY QUALITY TESTS

Variety or line	Fresh fruit				Panel evaluation of canned fruit ¹		
	Soluble solids	Total solids	pH	Titratable acidity, pct. citric acid	Appearance	Texture	Flavor
	<i>Pct.</i>	<i>Pct.</i>		<i>Pct.</i>			
Truhart-King Pharr.....	7.35	8.02	5.05	.247	6.6	8.2	7.3
Truhart-D.....	7.80	8.50	5.25	.255	---	---	---
Truhart-Pomona.....	7.80	8.50	5.30	.250	7.6	8.2	7.8
Bighart lines							
F,67-12.....	8.75	9.40	5.18	.250	8.4	8.6	8.0
F,67-17.....	8.50	9.30	5.15	.240	8.4	8.6	8.6
F,67-18.....	8.30	9.05	5.10	.240	---	---	---
F,67-21.....	8.60	---	5.20	.255	8.2	7.9	7.9
F,67-22.....	8.40	---	5.15	.225	---	---	---

¹ Each figure is an average of 10 scores assigned by 10 panelists on a scale of 1 = poorest to 10 = best. Evaluations were made of the 2-year canned product in 1969.

TABLE 3. COMPARATIVE PREPARATION LOSSES AND RECOVERY OF CANNED PRODUCT FROM TRUHART AND BIGHART PIMIENTO VARIETIES

Variety or line	Average fruit weight	Raw fruit weight	Flaming loss	Core weight	Total loss	Trimmed recovery
	<i>Lb.</i>	<i>Lb.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
Truhart-King Pharr.....	0.210	50.69	16.7	27.0	48.1	51.9
Truhart-D.....	0.227	11.37	16.4	28.9	44.7	55.3
Truhart-Pomona.....	0.209	10.44	16.2	28.5	44.1	55.9
AVERAGE.....	0.213	---	16.6	27.5	47.0	53.0
Bighart lines						
67-12.....	0.297	9.81	17.1	22.9	38.5	61.5
67-17.....	0.350	70.00	13.7	20.3	41.2	58.8
67-18.....	0.343	51.38	15.2	20.6	42.2	57.8
67-21.....	0.324	49.90	12.4	23.6	39.0	61.0
67-22.....	0.324	32.37	15.0	21.2	40.4	59.6
AVERAGE.....	0.335	---	14.1	21.4	40.6	59.4

TABLE 4. PHYSICAL PROPERTIES OF TRUHART AND BIGHART PIMIENTO VARIETIES

Variety	Specific volume, whole fresh ¹		Properties of canned product in pint jars, average of duplicate tests ²		
	Per pod ³	Per pound	Drained wt. per jar	Pod surface ⁴ area per lb.	Color ⁵
	<i>Cu. in.</i>	<i>Cu. in.</i>	<i>Lb.</i>	<i>Sq. in.</i>	
Truhart-King Pharr.....	9.5	41.1	0.88	123.3	819
Truhart-D.....	10.3	42.0	0.82	133.6	820
Truhart-Pomona.....	9.4	42.9	0.77	137.3	820
AVERAGE.....	9.8	42.0	0.84	131.4	
Bighart lines					
67-12.....	14.8	48.0	0.80	107.7	819
67-17.....	16.5	46.4	0.88	113.1	819
67-18.....	15.9	46.3	0.88	112.4	719
67-21.....	16.5	46.8	0.94	113.2	820
67-22.....	16.5	48.5	0.89	114.4	820
AVERAGE.....	16.1	47.0	0.88	112.2	

¹ Samples from 1967 crop at North Alabama Horticulture Substation, Cullman.

² Canned product tested May 1969.

³ Based on water displacement of 10-pod samples.

⁴ Opened, drained pods from pint jar laid flat in rectangular form and area determined.

⁵ Based on comparison with British Color Council Horticultural Color Chart. Each number refers to a color plate with four tones. The higher the number, the darker the color: No. 719 "Signal Red," No. 819 "Orient Red," and No. 820 "Blood Red."

lower preparation losses from its larger, thicker walled fruits. This gain is the result of the following combination of lower processing losses as compared with those of Truhart: 15.1 per cent from flaming, 22.2 per cent from core weights, and 13.6 per cent from total losses including trimming, Table 3.

Canned Product Quality

Of particular interest are the measurements of pod surface area per pound of fruit in the canned product, Table 4. These values are a measure of average fruit wall thickness. Bighart averaged 17.2 fewer square inches of fruit wall per pound of drained canned product than did Truhart. This is a gain of 13.3 per cent in fruit wall thickness over Truhart. A thicker fruit wall produces a firmer, better looking canned product. The canned product of Bighart was superior to that of Truhart in appearance, texture, and flavor as judged by a taste panel, Table 2.

Seed Production

Fruit weight averaged 0.31 pound for 514 first harvest Bighart fruits from se-

lected plants gathered August 8, 1968. Moist, freshly harvested seed accounted for 1.57 per cent and air-dried seed for 0.79 per cent of the fresh fruit weight. Dry seed yield per ton of fruit calculated from the latter value was 15.8 pounds, a satisfactory seed yield for pepper according to Knott (8). However, higher seasonal temperatures reduced seed production in Bighart, as shown by the following seed yields in pounds per ton at four successive 1968 harvest dates: August 9 - 14.4 pounds; August 28 - 1.8 pounds; September 18 - 4.0 pounds; and October 7 - 5.2 pounds. Thus, it is essential to harvest seed from early set fruit. A pound of Bighart seed contains about 63,000 seeds.

SUMMARY

Value of the Bighart Pimiento variety, developed by Auburn University Agricultural Experiment Station, has been established in Station tests. Being superior to the commercial Truhart variety in several economically important characteristics, Bighart should become important to the pimiento industry.

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