

Cucumber Varieties in Pickle Manufacture¹

by IVAN D. JONES² and JOHN L. ETHELLS³

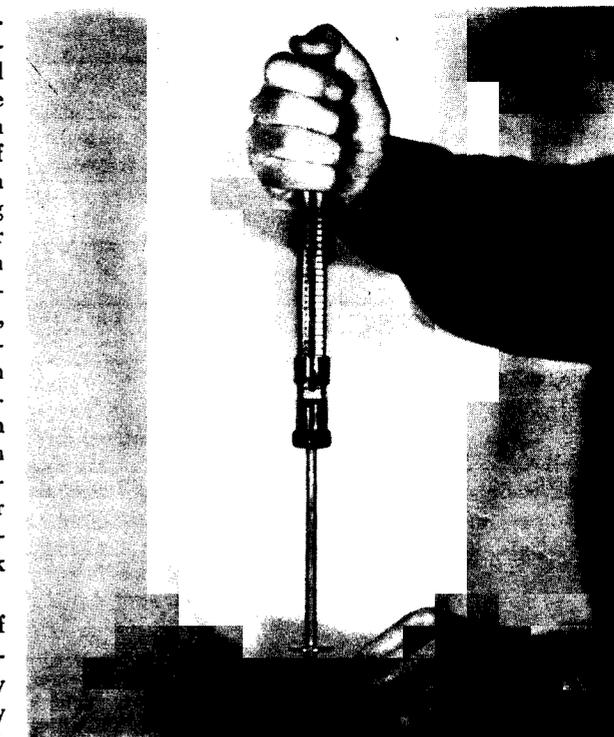
IN RECENT years the pickle-packing industry has introduced a number of new products which are representative of the pasteurized fresh cucumber pickle. At present it is estimated that ten per cent of the crop of pickling cucumbers are utilized for this purpose. The rapid expansion of the packing of this product has been responsible for the development of a number of cucumber production problems.

The packing of the pasteurized fresh pickle is essentially a "canning operation" in the sense that the crop is packed only from the fresh state. This means that the time-period for the pack covers only that during which green cucumbers are being delivered to the plant. With this type of operation in the average plant only a limited volume can be packed, unless methods of extending the crop-intake period are developed.

One method of extending the packing operation is to draw from both northern and southern growers

for green stock. This practice actually has developed to a considerable extent. At present a sizable portion of the early southern crop is being shipped by truck or rail into northern plants for the manufacture of fresh, pasteurized products. Also, northern packers are establishing branch plants in southern areas, or are contracting acreage for subsequent shipment of green-stock north.

The selection of a variety of cucumber especially adapted for heavy yields and high quality in the southern states has arisen with the expansion of cucumber production in this area. The National Association Pickling variety, subsequently referred to in this report as National, was developed for crop production in the North and has been reported by many southern packers as being less suitable than certain



other varieties for their area, particularly from the standpoint of production. Thus, we find many plants in the South favoring the growing of certain white spined varieties rather than those of the black spined type such as the National or similar varieties.

Definite drawbacks are recognized for many of the older white spined varieties which have been commonly used by pickle packers. These include: Poorly shaped fruits, especially among the smaller sizes; thick, tough skins; bitter, objectionable flavors; and, exceedingly dark color. An important point in favor of some of the white spined varieties has been greater yields.

Recently a number of new varieties of cucumbers have been introduced for pickling use. Certain of these are of the white spined and others are of the black spined type. Tests have been conducted in several important pickle packing areas in the southern states with both the newer and the older varieties. It is the purpose of this paper to summarize some of the observations made in these tests.

Nine varieties of cucumbers were grown at the McCullers Branch Experiment Station near Raleigh, N. C., in 1945. Samples of three different varieties were employed for storage tests. Other small lots were brined individually in mesh bags in vats at a commercial salting station. The brined stock was evaluated for quality as salt stock and as finished sweet

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²Department of Horticulture, N. C. Agricultural Experiment Station, Raleigh, N. C.

³Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture, Raleigh, N. C.

Table 1. Keeping Quality of Different Cucumber Varieties After 16 Days in Refrigerated Storage (40 - 45° F.).

(Cucumbers grown near Raleigh, N. C., 1945)

Variety	Number of Fruit Observed ^{1/} (all sizes)	Condition of Fruit			Spoiled Fruit as per cent of Total
		Good ^{2/} %	Wholly Spoiled ^{3/} %	Partially Spoiled ^{4/} %	
No. 1770, w. s. ^{5/}	79	72	0	28	28
New York, w. s.	149	69	0	31	31
Model, w. s.	101	63	0	37	37
Stays Green, w. s.	104	45	20	35	55
Earliest of All, w. s.	172	44	27	29	56
Producer, w. s.	99	42	0	58	58
Packer, b. s. ^{5/}	90	22	22	56	78
Ohio 31, b. s.	122	15	73	12	85
National, b. s.	88	7	59	34	93

^{1/} Represents cucumbers picked 7-13-45 (from one plot for each variety), stored in open paper bags at 40-45° F. and observed on 7-29-45.

^{2/} Refers to sound fruit without mold or evidence of rot.

^{3/} Refers to fruit wherein the major portion was mushy and/or moldy.

^{4/} Refers to fruit that was rotten or moldy in spots only.

^{5/} The letters w. s. indicate white spined varieties and b. s. black spined.

Table 2. General Quality of Salt Stock From Different Varieties of Cucumbers ^{1/}
(Cucumbers grown near Raleigh, N. C., 1945)

Variety	Firmness of Salt Stock	Color	Shape	Bloaters (Hollow Stock)	Remarks Concerning General Acceptability of Salt Stock by One Large Pickling Concern ^{2/}
National, b. s.	Good; Sound	--	Good	None	Wholly satisfactory; firmness and shape good.
Model, w. s.	Good; Sound	Too dark	Good	None	Too dark, otherwise satisfactory.
Earliest of All, w. s.	Good; Sound	On dark side	Slightly long	None	A little too long, and color on dark side. Firmness satisfactory.
New York, w. s.	Good; Sound	Too dark	Too long	--	Too dark and too long. Firmness satisfactory.
Packer, b. s.	Good; Sound	Good	Good	None	Best of lot; wholly satisfactory in all respects.
Stays Green, w. s.	Good; Sound	Dark in small sizes	Too many nubs and crooks	--	Color dark in small sizes, too many nubs and crooks.
Producer, w. s.	Inferior; mealy, divided	Good slightly dark	--	One or two	Firmness not equal to other lots. Appear mealy inside and divided (separation of carpels). Slightly dark. Color satisfactory.
No. 1770, w. s.	Good; Sound	Very dark	Too long	A number of partial bloaters	Color very dark; stock too long; too many bloaters or partial bloaters.
Ohio 31, b. s.	Good; Sound	Good	Too long in No. 2 size	Numerous in large sizes	Stock too long and slender in No. 2 and large No. 1 sizes. Color satisfactory. Probably bloaters all large sizes.

^{1/} 25-lb. lots of mixed sizes (Nos. 1, 2, 3) of each variety in net bags placed in a 640-bu. tank on July 10, 1945, at time it was being filled with National variety cucumbers. Examination of the bag samples was made March 18, 1946, after about 8 months storage in brine.

^{2/} Plant located in Eastern North Carolina

pickles. In addition to these studies, fresh lots of the nine varieties were manufactured into pasteurized, whole dill pickles and subsequently evaluated for quality.

The storage tests conducted on the freshly-harvested cucumbers grown near Raleigh, N. C., are reported in

Table 1. From this table it is seen that the white spined varieties surpassed the black spined varieties with respect to resistance to spoilage in storage.

An evaluation of the quality of the 1945 season salt stock from different varieties of cucumbers is presented

in Table 2. This evaluation was made using National as a standard of comparison.

Cucumbers from the same lots of salt stock evaluated in Table 2 were finished into small whole sweet pickles. These pickles fell into the size range of from 6,000 to 10,000

Table 3. Quality of Small Sweet Pickles Made From Different Cucumber Varieties ^{1/}
(Cucumbers grown near Raleigh, N. C., 1945)

Good	Fair	Fair to Poor
Earliest of All	Packer	New York
National	Stays Green	Model
Ohio 31	Producer	No. 1770

^{1/} Results based on two examinations; the first by eight judges one month after manufacture; the second by four judges after three months. Ratings were the same in both instances.

Table 4. Quality of Pasteurized Fresh Dills Made From Different Cucumber Varieties ^{1/}
(Cucumbers grown near Raleigh, N. C., 1945)

Variety	Quality Rating	Comments
Earliest of All	Good	Crisp pickle, uniform texture, low skin toughness
No. 1770	Fair to Good	Variable with respect to crispness and skin texture
National	Fair	Skin tender, but low in crispness
Ohio 31	Fair	Skin tough, but fairly crisp
Producer, Model Packer and New York	Fair to Poor	Inner portions soggy, skins relatively tough, crispness low
Stays Green	Poor	Tough, bitter skin; dark green color

^{1/} Made by a commercial plant and examined by five judges after five months storage.

cucumbers per 45 gallon barrel and were finished at about 22 grains vinegar (2.2 per cent acetic acid) and 26° Baume syrup (48° Brix). An evaluation of these pickles is presented in Table 3.

Fresh cucumbers of 1,200 to 1,800 size from one harvest of the nine varieties of cucumbers grown near Raleigh in 1945 were manufactured into pasteurized fresh dill pickles at a commercial pickle packing plant. An evaluation of these dills based upon the opinion of five judges is presented in Table 4.

During the 1948 season firmness studies were made on lots from thirteen varieties of cucumbers. These tests were made on the fresh (green) cucumbers at one harvest date and on salt-stock made from cucumbers from two harvest dates. This salt-stock was obtained by placing small lots of fresh cucumbers, contained in mesh bags, in a vat filled with cucumbers of the National variety or a mixture of National and Model varieties and brined according to regular commercial practices. The salt

stock firmness tests were made after about ninety days' curing in brine. The cucumber varieties were grown and harvested by the Arkansas Agricultural Experiment Station at Hope, Arkansas, in connection with varietal trials. They were brined at the Brown-Miller Company at Texarkana as a cooperative project between the station and the company mentioned. Seed for the varieties, Model, Packer, Producer, and New York were obtained from the Associated Seed Growers, Inc.; for the varieties National, Black Diamond, Heinz, Stays Green, Variety X, Double Yield, Snow's Perfection, Klondike, Mincú and Short Stem Snow's Perfection from Lawrence Robinson and Sons; and for the variety Magnolia from Mississippi State College.

Cucumber firmness was estimated by means of the U. S. Department of Agriculture fruit pressure tester. This device measures the resistance offered by a fruit to puncture by means of a bluntly-tipped rod. Statistical analysis of the pressure test readings indicated that there were significant

differences between the firmness of the cucumbers of different varieties. The National variety has been used as a standard of comparison. A summarization of the observations made is presented in Table 5.

The use of the pressure tester as an indicator of quality of either fresh or brined cucumbers has been proposed on the basis of studies previously conducted at this station on the National variety. From these earlier studies the following relationship between pressure test values and quality, as determined by general inspection of salt stock, was suggested, namely: Values above 18 represent good stock; values between 18 and 14 represent fair to good stock; and values between 14 and 10 represent fair to poor stock when the U. S. Department of Agriculture fruit pressure tester fitted with a 5/16" tip was used. The limits of quality of green cucumbers have not been worked out, but recently harvested National green stock usually tested about 20 to 22 on the instrument previously mentioned.

Table 5. Firmness of Different Cucumber Varieties Before and After Brining (Arkansas Stock - 1948 Season).

Fresh (Green) Material		Brine Cured Material (after 90 days)			
Variety	PT ^{1/}	Lot A ^{2/}		Lot B ^{3/}	
		Variety ^{4/}	PT ^{1/}	Variety ^{4/}	PT ^{1/}
New York	21.6**	Black Diamond	19.6**	Model	20.6**
Model	21.1	Model	19.2**	Black Diamond	20.4**
Packer	21.1	New York	19.0**	Stays Green	19.9
Davis Blend	20.9	Packer	18.8**	Short Stem Snow's	
Magnolia	20.6	Heinz Pickle	18.5	Perfection	19.3
Stays Green	20.5	Stays Green	18.4	Heinz Pickle	19.3
Black Diamond	20.3	Klondike	18.4	Klondike	18.8
Mincú	20.3	Snow's Perfection	17.8	Packer	18.4
National	20.1	Double Yield	17.6	National	18.1
Snow's Perfection	19.9	Davis Blend	17.5	Davis Blend	17.4
Variety "X"	19.2	Short Stem Snow's		Snow's Perfection	17.2
Producer	18.8*	Perfection	16.9	Double Yield	17.0
Double Yield	18.6*	National	16.8	Magnolia	16.7
		Magnolia	16.2	Variety "X"	13.1*
		Producer	15.3*	Producer	13.0*
		Mincú	14.4*	Mincú	12.5*
		Variety "X"	13.2*		

^{1/} Pressure test in pounds resistance to 5/16" tip of U.S. Dept. of Agr. pressure tester. Values represent average of stem and blossom end readings for usually 10 cucumbers for each variety of No. 2 size (up to 1 1/2" dia.).

^{2/} Lot A bag samples placed in Vat 31, headed July 13, 1948 and contained 480 bu. Model brined at 35° sal. treatment; P. T. value after curing, 19.2.

^{3/} Lot B bag samples placed in Vat 75, headed July 9, 1948 and contained 500 bu. of National and Model mixed, brined at 35° sal. treatment. P. T. value after curing; Model 19.3, and National 19.4.

^{4/} These varieties, Heinz Pickle, Klondike, and Stem Snow's Perfection, tested in cured state but not in fresh state.

**Significantly more firm than National.

*Significantly less firm than National.

Table 6. Opinions expressed by 3 pickle packers concerning characteristics of salt stock made from several varieties of cucumbers grown by Arkansas Agricultural Experiment Station 1948.

Variety	Opinions expressed concerning characteristics enumerated		
	Shape	Color	General Acceptability
Davis Blend	Good	Good	Good
National	Good	Good	Standard of comparison
Snow's Perfection	Fair to Good	Good	Generally acceptable
Mincu	Too short, stubby	Acceptable	Not satisfactory
Packer	Excellent	Good	Best of all varieties examined this date
Producer	Too short, stubby	Good	Not of interest to these judges
Model	Good	Good, on dark side	Skin not as tender as desirable
Stays Green	Too long, pointed	--	Unacceptable as to shape
Black Diamond	Too long, pointed	Dark color	Like Stays Green
New York	Too long, slender	Glossy, dark green	Unacceptable as to shape
Magnolia	Too long, irregular	Fair	Not satisfactory
Double Yield	Gourd shaped	--	Not good for pickles
Variety X	Too long	Dark	Undesirable

The results summarized in Table 5 indicate that there is a considerable difference in firmness of either the fresh cucumbers or the salt stock made therefrom when comparison of varieties is made. Furthermore, these results show that the comparative firmness rank of salt stock was similar to that of the fresh cucumbers in most cases. Certain varieties of cucumbers deteriorated or lost firmness in brine storage appreciably more rapidly than others over the time period tested. The latter observation is important in view of the fact that most commercial cucumber pickling plants commonly hold brined cucumbers for periods of from nine months to about two years. It further emphasizes the importance of carefully testing the comparative behavior of new and old varieties under known conditions of brine storage, when considering the adoption of new varieties.

In Table 6 are summarized the opinions of three commercial pickle packers concerning the characteristics of the salt stock made from a number of varieties of cucumbers.

Summary

A number of varieties of cucumbers have been studied with respect to the relation of varietal characteristics to quality in the manufacture of pickles. These studies were made on fresh and brine cured stock, sweet pickles, fresh pasteurized dills and fresh cucumbers held in refrigerated storage.

It was found that rather wide differences in product quality existed and that these differences were associated with varietal characteristics. This comparative study is being continued.

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