Effects of DCNA and Prepackaging on the Retail Quality of Sweetpotatoes[1]

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Abstract. **In 8 tests, sweetpotatoes [*Ipomoea batatas* (L.) Lam.] treated with 2,6-dichloro-4-nitroaniline (DCNA) and packaged had less waste after a week in a retail store than either treated or untreated sweetpotatoes retailed in bulk. Very good control of rhizopus soft rot in sweetpotatoes on sleeve-wrapped and completely overwrapped trays was obtained by DCNA. The combination of DCNA and the complete overwrap effectively reduced retail losses from soft rot and desiccation.**

A market losses study begun in 1970 showed decay and shriveling, usually associated with mechanical injury, to be the chief causes of loss in sweetpotato roots retailed in the New York area. While sweetpotatoes are ordinarily treated with a fungicide, usually DCNA, shipping jumble-packed roots to market and retailing them in bulk can offset the good derived from the treatment. Sweetpotatoes marketed in bulk are commonly rubbed, scuffed, cut, cracked, and otherwise bruised by the handling they receive in marketing channels. Bruised surfaces often become discolored and sunken from excessive moisture loss, rendering the roots unattractive if not unsalable. More importantly, the injured areas allow infection by the destructive soft rot fungus, *Rhizopus stolonifer* (Erh. ex Fr.) Lind.

Previous work has demonstrated that prepackaging sweetpotatoes reduces weight loss and injuries (1, 4, 7). Treating roots with DCNA has reduced soft rot in sweetpotatoes shipped to market and in tests simulating marketing conditions (2, 3, 5, 6, 8). However, the combination of DCNA treatment and prepackaging of sweetpotatoes has not been documented in retail stores. Commercial interest in prepackaging sweetpotatoes with automated equipment motivated a retail store study on the effectiveness of DCNA against soft rot in prepackaged sweetpotatoes while evaluating the relative merits of 2 prepacks.

Five tests were conducted in early spring of 1971 and 3 tests during the winter of 1971-72. In each test, 20 to 25 kg of 'Centennial', 'Jewel' or 'Yellow Jersey' sweetpotatoes were used for each of 6 treatments. The sweetpotatoes were treated as follows: 1) DCNA-treated roots on molded pulp trays, sleeve-wrapped with a shrinkable plastic film; 2) untreated roots on sleeve-wrapped trays; 3) DCNA-treated roots on trays completely overwrapped with a shrinkable film; 4) untreated roots on completely overwrapped trays; 5) DCNA-treated roots packed in bulk; and 6) untreated roots bulk-packed. An unperforated, heat shrinkable 60 gauge polyvinyl chloride film was used for wrapping the trays.

Sweetpotatoes were washed, graded, treated and packaged in a New Jersey packinghouse. DCNA was applied through overhead spray nozzles at a concn of 900 ppm. For prepackaging, about 1 kg of sweetpotatoes was manually positioned in a tray, measuring 22.9 x 15.2 and 2.5 cm deep with 4.5 cm ends for sleeve wrapping and 25.4 x 15.2 and 2.5 cm deep for complete overwrapping. The sleeve wrap was applied by handwrapping the plastic film around the tray leaving 2-4 cm of the tray ends uncovered. The wrapping and film sealing of the complete overwrap was performed by machine in 5 tests and by hand in the last 3 tests when the machine was unavailable. Because the automated process caused tiny tears and burns that perforated the film, the overwrap applied by hand was punctured twice by a 6-penny common nail. After the film wraps were shrunk by passage through a heat tunnel, the trays were placed 4 deep in 6 cells partitioned by a vertical fiberboard divider within a master carton. Non-packaged sweetpotatoes were packed loose in a carton holding about 23 kg. The sweetpotatoes were then moved by auto 85 miles to our laboratory in Belle Mead, N. J., where they were held for 4-5 days at 15.6°C and 75% RH.

After this simulated wholesale period the 6 lots representing the 6 treatments were delivered to a food-chain supermarket. There 1/3 of each lot (1 carton) was placed on the produce shelf and the remainder stored in the basement (15.6-18.3°C) till used to successively replace the displayed roots twice after 2 or 3 days on the shelf. Thus the contents of each lot were divided and displayed at 3 separate intervals over a 1-week period. Although the sweetpotatoes were withheld from the public, they were subjected to daily handling and inspection except for the weekend. Decayed and shriveled culls and trays with visible rot were removed from displays when found. At the end of the shelf stay, weight and cull losses were noted for each lot. Sound sweetpotatoes from each lot were also boiled and tasted for possible off flavors.

The combination of DCNA and prepackaging sharply reduced overall wastage of sweetpotatoes on the retail shelf (Table 1). Completely overwrapped lots treated with DCNA showed the least loss, 2.8%. DCNA-treated sweetpotatoes within the sleeve wrap also showed a low level of wastage, 3.7%. The difference in wastage between the treated lots was due almost wholly to the higher moisture loss of roots in the sleeve-wrapped trays. Bulk lot losses were comparatively high, 9.3% in the DCNA-treated roots and 12.7% in the untreated roots. Much of the loss in the bulk lots was attributed to moisture loss. This category included roots rendered unmarketable by excessive moisture loss. These culls comprised almost 20% of the total moisture loss.

Soft rot losses in the prepackaged lots without DCNA were relatively high, 6.1 and 6.3% in the sleeve wraps and in the complete overwraps, respectively (Table 1). DCNA reduced soft rot by about 90% in the prepackaged lots. Only 4 overwrapped and 6 sleeve-wrapped trays out of 192 units in each lot exhibited rot. The package doubtless provides some protection against mechanical injuries that allow rot infections to occur. DCNA protection is essential, however, to combat soft rot in prepackaged units

Table 1. Decay and wt losses in sweetpotatoes during 1 week in a retail store.[z]

Treatment	% unsalable packages	% soft rot losses[x]	% moisture losses[y]	% total losses[x]
Sleeve wrap + DCNA	3.1	0.4 d	3.3	3.7 e
Sleeve wrap	28.1	6.1 ab	3.1	9.2 abc
Complete wrap + DCNA	2.1	.5 d	2.3	2.8 e
Complete wrap	28.6	6.3 a	2.3	8.6 bcd
Bulk + DCNA	--	1.0 d	8.3	9.3 ab
Bulk	--	4.4 abc	8.3	12.7 a

[z]Combined data of 8 tests.
[y]Includes wt of culls shriveled by desiccation in bulk lots.
[x]Mean separation within columns by Duncan's multiple range test, 5% level.

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where the presence of one rotted sweetpotato makes the whole package unsalable. Without the DCNA treatment, about 28% of the prepackaged units had soft rot. The 'Yellow Jersey' variety had the most soft rot and 'Jewel' the least. However, results among treatments were consistent within a test.

Soft rot wasted 4.4% of the bulk lot without DCNA and but 1.0% of the bulk lot protected by DCNA. The lower degree of soft rot in the untreated prepackaged lots resulted from the depressing effect the store's relative humidity (42-54% RH at 20.6-22.2°C) had on rot development.

In evaluating both prepacks, the complete overwrap appears slightly superior to the sleeve wrap. The sweetpotato roots within the complete overwrap are less apt to dislodge than in the sleeve-wrapped tray. Less weight loss results when the complete overwrap is used. While only the complete overwrap was applied by automated machinery in our tests, sleeve wrapping probably also could be automated.

The principal precaution in completely overwrapping sweetpotatoes is to permit adequate transmission of the metabolic gases (4). No off flavors were detected in cooked samples from any test lot, indicating gas exchange was adequate in the prepackaged units.

In conclusion, the use of DCNA and the complete overwrap utilizing a film that permits adequate gas exchange, preferably through perforations, appears most satisfactory towards reducing wastage of sweetpotatoes in retail.

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The Effect of Trithion on the Flavor of Lowbush Blueberries[1]

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Abstract. **Samples of Maine-grown lowbush blueberries (*Vaccinium angustifolium* Ait) from untreated and Trithion-treated (2 applications, 272 g/0.4 ha) plots evaluated 8 times by a 35-judge panel were not different from each other or from a standard of untreated berries. No off-flavor was associated with the Trithion-treated blueberry samples.**

In 1961, data resulting from a regional project on the effects of insecticides and fungicides on the flavor quality of fruits and vegetables were published (2). The authors intended that the listings should be used as a reference guide and not as endorsement or condemnation of any pesticides or combinations thereof. The need for continued and multiple observations was stressed.

Trithion (Carbophenothion), insecticide and acaricide, has been registered by the U. S. Department of Agriculture, and tolerances established by FDA for use on many crops (1). This investigation was designed to test the effect of the chemical treatment on the flavor quality of Maine lowbush blueberries. Trithion has been shown by one of us (H.Y.F.) to be effective in the control of maggot (*Rhagoletis mendax* Curran) on this crop.

One large plot (8 × 30 m) of lowbush blueberries at Blueberry Hill Farm, Jonesboro, Maine was treated with 3% Trithion dust at a rate of 272 g actual per 0.4 ha, applied on 2 occasions: July 14 and 25. The treated plot was flanked on either side by untreated control plots, 5 × 30 m. On August 18, the berries for the flavor test were harvested in a systematic random way throughout the plots. Approx 4 kg of treated and 8 kg of control berries were brought to Orono, refrigerated at 4°C until August 21, when the berries were evaluated for flavor quality.

Coded samples of about 10 berries each were presented in 8 pairs (2 at a time) to a panel of 35 experienced judges. The ballot used was developed for the evaluation of flavors associated with pesticide treatments (2), and later modified to omit a category shown to be superfluous (3). The untreated berries were also presented as a labeled reference standard to compare with the unknown sample pair. Panelists were asked to taste all of the berries in a sample before making a judgment.

Scores were assigned to the choices: +1 for "better than standard;" 0 for "equal to standard;" and -1, -2, -3 for "degrees of off-flavor." The resulting data were analyzed by the variance method, using the treatment × judge interaction as the error term.

Soluble solids of 8 samples of 10 berries each, control and treated, were determined by refractometer.

Table 1. Effect of Trithion on the flavor and soluble solids of Maine lowbush blueberry (8 samples).

Trithion (g) per 0.4 ha	Flavor score[z]	Soluble solids (%)
0	−0.05	12.18
272 + 272	+0.03	10.90
LSD 5%	NS[y]	1.00
1%	NS	1.39

[z]35 judges; both values not different from untreated standard.
[y]not significant.

The analytic data (Table 1) show mean scores of -0.05 for the 8 untreated samples and +0.03 for the treated ones, both interpreted as "equal in flavor to the untreated standard" which was 0 on the scale.

The mean soluble solids for 8 untreated samples, 12.18%, was 1.28% higher (P = 5%) than berries from the Trithion-treated plot, 10.90%. Obviously, this difference was not large enough to be reflected in the sensory decisions.

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