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Summary

It costs more to produce red apples than green ones. Also, it is almost impossible to produce a crop of apples all of which are highly colored. Color is an important factor in influencing apple sales in the fresh market. In the stores studied, sales could be increased approximately 75 per cent on average by increasing the area of solid red color on the surface of the apples from 15 to 50 per cent. However, as the price of red apples was increased, sales decreased and total dollar returns also decreased. This indicates that there are close substitutes for red apples and as the price increases consumers switch to other products. Therefore, in establishing price premiums for redness, the effect of price on sales volume must be considered.

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APPLE COLOR – –

Its Development and Sales Appeal*

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Introduction

IT is generally felt that the more highly colored the red varieties of apples are, the more they are preferred by consumers. What effect does redness have on sales volume? Are consumers willing to pay a premium for highly colored red variety apples? What can the grower do about improving apple color? Should apples be sorted more closely on a basis of color? These are some of the questions that this report is directed toward answering.

Work in Developing Redness in Apples. For more than twenty years, the West Virginia University Agricultural Experiment Station has been doing research work on color of apples. Until recently, this work has been in the field of production rather than in marketing. Although much progress has been made, no practical method has been developed to assure producers that all apples on a tree will be uniformly and fully red colored.

The following factors have been studied in relation to their effect on apple color: (1) fertilization, (2) pruning, (3) chemical sprays, (4) sport mutations, (5) weather and climate, (6) thinning of fruit, (7) age of tree, (8) photosynthesis and number of leaves per fruit, (9) irrigation, and (10) pollination. A brief summary of some of the results of these studies follows.

In some fertilizer studies, potassium has been observed to be responsible for increased red color, whereas in other investigations it has shown no effect. Excessive amounts of nitrogen often decrease or delay color formation by increasing the growth of the tree. Increased growth

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decreases fruit color in two ways: (1) the extra growth does not allow sunlight to reach the apples as readily, and (2) sugars necessary for color formation are utilized for growth. Since heavy nitrogen applications increase tonnage, growers selling to the processing plants do not hesitate to use liberal amounts of this element because the lack of color does not adversely affect cannery grades. The production of apples under sod culture has given more color to apples than where the orchard is cleanly cultivated. This was probably a nitrogen relationship, since the sod would be utilizing nitrogen that would otherwise be available to the trees, and additional soil nitrogen is released by cultivation.

The pruning of bearing apple trees admits more sunlight to the inner parts of the plant, allowing fruit in these areas to develop greater color. Also, a well-pruned tree makes for better air circulation, and its foliage and fruit will dry more quickly following a rain or heavy dew. This lessens the amount of russeting caused by protective chemical sprays. Russeting tends to mask and dull the color of several varieties of apples.

In the early thirties, the West Virginia University Agricultural Experiment Station made chemical analyses of apple color and initiated investigations in injections and sprays. The use of cane sugar as a fertilizer, and in solution for direct injection into trees gave increased apple color on Stayman trees. These findings did not have an economical application to the growers' practices. However, some research with thiocyanate sprays seemed to show promise as a practical way to improve color. This seemed particularly promising for the improvement of the yellow color in Grimes and Golden Delicious varieties. These investigations were dropped for a time but are now active again with further testing of the thiocyanates in conjunction with some of the newer chemical compounds.

Probably the greatest progress on color improvement of apples has been in the field of selection. On rare occasions the red varieties have a bud and later a limb that produce fruit of a much higher color than the original variety or part of tree. Propagating wood taken from this limb will develop into trees producing fruit of this higher color. Orchard owners, managers, and research workers have found these higher-colored-fruit-bearing branches and vegetatively propagated them. This has resulted in redder Delicious, Stayman, Rome, MacIntosh, Jonathan, and Winesap apples. Now apple branches are being found on these redder varieties which have even more color. These higher colored sports or mutations of standard varieties have been called "double reds" and the still more highly colored apples from these "double reds" are being referred to as "triple reds." In the enthusiastic

acceptance by growers of more and more color in these sport selections, there is a probability that growers can go too far in putting on the market a dark red or "mahogany" colored fruit, which could be less attractive to the consumer than the brighter "cherry" red color.

As an apple approaches maturity, the color development is dependent on the actual amount of sunlight that comes in contact with the skin of the fruit. In areas of Northwestern United States, the clear sunny cool days of rather low humidities help develop highly colored apples with a bright, lustrous finish. Hot days with warm nights in areas where humidities are high, coupled with fog or cloudiness, will give poor color with a dull finish. Color will vary from year to year in the same locality depending upon amount of sunlight, humidity, and temperature. Also, the use of stop-drop chemicals to keep the apples on the trees for a longer period during favorable weather will produce a riper, sweeter, and more highly colored apple on some varieties.

The combined use of good pruning, thinning, fertilization, color sprays, and stop-drop sprays in the best locations with "double red" color sports will not give a crop that grades 100 per cent Extra Fancy. Growers will continue to have the problem of finding a market for the poorer colored fruit. Canners and fruit processing plants offer one outlet, peddlers and itinerant truckers also are purchasers of these commercial and utility apples. There is a marketing problem of how to get the greatest returns from these apples with less color. Grades of apples, from the "Number One" up, are largely based on amount of color differences, and the pricings of these grades have been based on experiences of the wholesale dealers. There is no doubt that color helps to sell apples. Is the present price range of grades based on color differences correct for the best interests of the grower, dealer, and consumer? There is more expense in the production of red apples of the fancy grades. Good apples with less color might be accepted by the consumer at a lower price. This could return a profit to the growers because of cheaper production costs. However, until better methods are developed for getting more bright red color on apples, it seems desirable to study the marketing of apples containing varying amounts of red color.

Effects of Variation in Red Color and Price on Retail Sales. An experiment was conducted in nine retail stores to determine the effect of color and price on the sales of Rome Beauty apples.

Two lots of these apples were packaged in five-pound bags — similar in all respects except color — one lot was packed with about 15 per cent red color (later referred to as green apples) and the other

with approximately 50 per cent red color (later referred to as red apples). The former met the color requirements for U. S. Number One grade and the latter for U. S. Extra Fancy.

The experiment was conducted in the stores of The Kroger Company in Charleston and Huntington, during January, February, and March, 1956. Within each store the size and location of display were the same for the duration of the experiment. Displays were kept up at all times and a daily record of sales was taken.

The latin square experimental design was used. This tends to minimize the effect of such variables as time and store differences. The experiment was divided into two sections. The first section ran for five weeks in five stores using five different merchandising practices. The practices were: (1) matched lots of red and green apples, 5 lbs. for 49 cents; (2) green apples, 5 lbs. for 49 cents; (3) red apples, 5 lbs. for 49 cents; (4) red apples, 5 lbs. for 59 cents; and (5) red apples, 5 lbs. for 69 cents. Table 1 gives the results of the first experiment.

Table 1. Apple Sales and Returns with Different Merchandising Practices, 1956

Merchandising Practice	Sales*			
	Volume in Number of 5-Lb. Bags		Gross Dollar Volume	
1. Matched lots - 5 Lbs. / 49 cents				
(a) Red apples	391		192.57	
(b) Green apples	100		49.00	
		493		241.57
2. Green apples – 5 Lbs. / 49 cents		394		193.06
3. Red apples – 5 Lbs. / 49 cents		743		364.07
4. Red apples – 5 Lbs. / 59 cents		583		343.97
5. Red apples – 5 Lbs. / 69 cents		422		291.18

*Sales are the aggregate of the sales for each merchandising practice. For example when red apples were selling for 5 lbs. for 69 cents 422 5-lb. bags were sold. The figure of 422 is the sum of the sales from each store in the experiment and each week, when that particular practice was offered.

As a whole, when consumers were confronted with matched lots of red and green apples at the same price they purchased 393 bags of red apples and 100 bags of green apples – almost four to one in favor of red apples. However, sales were one-third less than when only red apples were offered at the same price of 5 lbs. for 49 cents. This may be partly accounted for by the fact that the total area of display was the same when only red apples were offered as when matched lots of red and green apples were offered. Dividing a given display space into two offerings may somewhat distract from its general appearance and

thereby reduce sales. Customers were quite responsive to increases in the price of red apples. As the price increased from 5 lbs. for 49 cents to 5 lbs. for 69 cents, sales decreased from 743 bags to 422 bags and dollar returns decreased from $364.07 to $291.18. Results indicate that the demand for red apples is elastic.

Customers responded more to a change from red to green apples at the same price (5 lbs. for 49 cents) than a 4-cent per pound or 20 cents per bag decrease in price for red apples. Sales were decreased from 743 bags to 394 bags by switching from red to green apples, both lots selling for 5 lbs. for 49 cents. However, sales were reduced from 743 bags for red apples at 5 lbs. for 49 cents to 422 for the same apples at 5 lbs. for 69 cents.

The second section of the experiment ran for four weeks in four stores using four different merchandising practices. The practices were: (1) red apples, 5 lbs. for 55 cents; (2) green apples, 5 lbs. for 55 cents; (3) green apples, 5 lbs. for 45 cents; and (4) green apples, 5 lbs. for 35 cents. Table 2 gives the results of this experiment.

Table 2. Sales and Returns with Different Merchandising Practices, 1956

Merchandising Practice	Sales*	
	Volume In Number of 5-Lb. Bags	Gross Dollar Volume
1. Red apples — 5 Lbs. / 55 cents	363	199.65
2. Green apples — 5 Lbs. / 55 cents	227	124.85
3. Green apples — 5 Lbs. / 45 cents	254	114.30
4. Green apples — 5 Lbs. / 35 cents	296	103.60

*Sales are the aggregate of the sales for each merchandising practice. For example when green apples were selling for 5 lbs. for 35 cents 296 5-lb. bags were sold. The figure of 296 is the sum of the sales from each store in the experiment and each week, when that particular practice was offered.

Tables 1 and 2 show that consumers responded less to a change in price for green apples than for red apples. In the price range from 5 lbs. for 55 cents to 5 lbs. for 35 cents, sales increased from 227 to 296 respectively. However, dollar returns decreased from $124.85 to $103.60, which indicates that for that price range the demand for green apples is slightly inelastic. Again, consumers responded more to a switch from green to red apples at the same price (5 lbs. for 55 cents) than to a 4-cent per pound decrease in the price of green apples. By switching from green to red apples, sales were increased from 227 bags to 363 and by reducing the price of green apples from 5 lbs. for 55 cents to 5 lbs. for 35 cents, sales were increased from 227 to 296 bags.