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# Preparing Apples for Market and Their Sale

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Fig. 1.—The picking of a large crop of apples requires considerable amount of labor and good supervision. (U.S.D.A.)

Growers, dealers and, to a large extent, also consumers know that the value of any fruit, including the apple, depends on quality. A visit to any wholesale market or large fruit store where apples are on display will convince one that many buyers and consumers are willing to pay a good price, often a premium, for a quality product. This certainly is true in times of relative prosperity such as exists during war and post-war periods. If apples are unattractive or

otherwise undesirable, many people will turn to other competing fruit.

The following quotation from a recent issue of the St. Louis Daily Market Reporter may be used as a case in point:

"The receipts of apples were heavy and No. 1 fruit was moving well at a steady price. Low grades were weak, lower and more or less neglected, being salable only to the cheaper class local trade."

While in some cases the poor appearance or low quality of apples often found on markets is due to negligence of the dealer or the storekeeper, frequently it is the grower's fault. After 30 years of study of apple handling and marketing, *from a growers' point of view*, a national authority concludes that "dealers can often be blamed for considerable deterioration in the quality or condition of the fruit, but the primary responsibility for poor condition more often rests with the grower or shipper". A no small cause of this poor showing of apples in the stores is due to carelessness in handling the crop before it comes into the hands of retailers.

Missouri produces apples good in appearance and fine to eat. If the orchardist has thought it worthwhile to invest money and effort in bringing the fruit to maturity, he should be equally conscientious in harvesting and preparing the crop for the market, in order to obtain the best price for his product.

It is the object of this circular to call to the growers' attention the chief reasons for taking certain precautions during the various stages of moving the crop. Some emphasis will be placed on the less understood marketing side of the fruit handling job, direct observation on which has been made by one of the writers for the past few years on practically all produce markets of the state.

The information given here should be of particular value during the present war conditions. Because of scarcity of labor and difficulties in transportation, great waste may occur unless the growers, wholesalers, and retailers all along the line in the fruit business make a strenuous effort to handle apples right. The consumers have a markedly increased income and buying power now, and good fruit is selling at a satisfactory price. The fundamental considerations are applicable to peacetime conditions also.

### **Changes in Apples While Maturing on the Tree**

In handling and marketing apples one should constantly keep in mind the fact that *a fruit is a living thing*. It undergoes continuously internal changes and is affected markedly and permanently by all environmental factors, such as temperature, humidity, physical pressure, etc. Once having changed, no known treatment can put it back into its original or earlier condition.

An apple is usually called "green" when immature. It is not only green in appearance but also in every other respect. In comparison with a fully developed apple, such a fruit is smaller in size, harder in texture, sourer and generally less palatable. As the fruit grows it increases greatly in volume and the flesh becomes softer and is more easily bruised. These changes in size and softness are due to enlargement of the cells and a decrease in thickness of the cell walls.

During the time of maturing, the skin of most varieties of apples undergoes a change in its foundation color. It turns from grass green to yellowish green or even yellow color. The blush or red color spreads over a larger area and becomes brighter. There is an increase in thickness of the waxy protective outer layer of the skin, the cuticle.

These visible structural changes are accompanied by internal chemical alterations. Young apples contain some starch, are acid and puckery. When nearing maturity the starch and parts of the cell walls change into sugar, which is added to the amount already present, and the fruit becomes sweet. At the same time the acid content decreases and the apple acquires gradually its characteristic desirable aroma and flavor.

### Maturity and Ripeness

When *mature* an apple may be ready to pick, but usually it is not *ripe* or ready to eat.<sup>1</sup> Ripeness, or eating quality, usually develops *after* the fruit has been harvested. This may take place in a few days or a few months, depending on the variety, the stage of maturity at which the fruit has been picked, the speed of handling, the storage temperature, and other factors. When ripe, an apple attains a desirable perfection in its physical and chemical state and then deteriorates, sometimes rapidly, becoming less desirable for eating and cooking purposes.

In successful handling and marketing of the crop, harvesting and picking operations should be so timed and adjusted that the apples are shipped in the most desirable state. That is the growers' responsibility. The buyers, wholesalers and retailers, in turn, should handle the crop with judgment and care, so that apples are received by consumers at or near the peak of perfection. That is the dealers' duty and responsibility. It is not always easy and possible to attain these goals, but every effort should be made to approach them as closely as possible. Only by doing that can we hope to maintain and possibly increase our present consumption of apples. Most consumers do not know how fine a fruit the apple is when at its best.

<sup>1</sup>As used here, the term *mature* is descriptive of the ideal condition for harvesting and the term *ripe* is indicative of the best condition for eating. Frequently these words are used interchangeably which seems to be undesirable.

## HARVESTING

### Picking Summer Apples

Summer varieties, like Yellow Transparent, Duchess, Wealthy, and others are usually picked whenever they have reached a sufficient size. They are harvested commonly in a greener state than are winter apples. Color, while desirable, is not an important requirement of these "cooking apples". Being used almost exclusively for culinary purposes, a certain amount of greenness or acidity seem to be highly desirable. Who does not enjoy a "green apple pie"?

Because of the relatively high price paid for good apples in summer, especially when there is a shortage of peaches and other competing fruit, they are often picked too early. When very green and hard they are not palatable, no matter how used. Moreover, there is an abnormally large loss from peeling and coring small apples. This short-sighted practice is injurious to the sale of summer apples.

Picking should be started when the green ground color turns to a yellowish tinge and the flesh begins to soften slightly. Size of the fruit is not a good guide. It is determined largely by the amount of fruit on the tree and the moisture supply from the soil. The heavier the tree is loaded and the less water there is available, the smaller will be the fruit.<sup>2</sup>

There is a certain sequence of harvesting the various summer varieties of apples, beginning with Yellow Transparent and ending with Wealthy and other sorts. This is learned best by experience.

Although summer apples may appear hard, some of the softer types bruise easily, leaving brown marks as evidence of rough handling. In fact, small size and brown spots are two of the chief defects that cut down the sales' value of many summer apples that otherwise are free from insect and disease blemishes.

Sometimes overmaturity, resulting in so-called "mealy" fruit, is an objectionable feature in marketing early apples. This may occur when harvesting and packing or marketing are unduly delayed and the weather is hot. The unwise use of preharvest sprays to reduce excessive dropping may also result in overmaturity since these sprays, while making the apples stick to the tree, do not delay their getting softer.

### Picking Winter Apples

It is more difficult to determine the proper time to pick winter than summer apples. The number of varieties to deal with is larger and there is great variability in their maturity, storage capacity and season of ripening. For immediate use or local trade they are often harvested in what is popularly known as the "hardripe" stage, or when they commence to drop or when labor is most available. Under present (1944) war conditions the scarcity of labor is bound

<sup>2</sup>See "Factors affecting size and color of fruit", Mo. Agr. Exp. Sta. Bul. 428.

to influence greatly the grower in deciding when and how fast to pick the crop, especially when it is large. Transportation and market conditions may also affect the speed of handling the fruit.

Picking of winter apples should be particularly well timed if they are intended for a prolonged storage. Moreover, they must be handled more carefully and with greater speed through the packing operations, especially when the weather is warm. Too long a delay may ruin their normal storage capacity.

### Tests for Maturity

There are several signs which the grower may use to determine picking maturity of apples, such as the ease with which the fruit separates from the spur, browning of the seeds, the general texture and flavor of the fruit, etc. None of them are absolutely reliable. Commercial growers, who handle a considerable amount of apples, have been relying as guides on changes in green color of the skin, softening of the flesh and more recently on the number of days that have elapsed from full bloom.

**Color.**—As apples mature the green ground color becomes gradually yellower. A greenish yellow tinge of the skin is usually associated with the so-called "hardripe" stage, at which most varieties should be picked. For a more careful timing, a color chart may be consulted.<sup>3</sup>

**Pressure test.**—Changes in softness of the flesh may be tested with the thumb, but it is far more accurate to use for this purpose a calibrated mechanical "pressure tester". On the basis of prolonged use of this device, workers of the U. S. Department of Agriculture have correlated approximate pressure standards for picking some of our popular varieties of apples: (The figures are expressed in pounds of resistance to pressure by a standard plunger of the instrument).

Jonathan	16 lbs.	Delicious	17 lbs.
Golden Delicious	17 "	Grimes	18 "
Rome	17 "	York	19 "
Stayman	17 "	Winesap	21 "

The respective varieties, when picked in the above states of hardness (pressure in lbs.), in what the U. S. D. A. describes as either the "hard" or "firm" stages, mostly the first.<sup>4</sup> In this state of maturity apples are suitable for cold storage and long distance shipment. For short storage or prompt use they may be allowed to become softer on the tree and the resistance to pressure would

<sup>3</sup>See U. S. D. A. Dept. Bul. 1448.

<sup>4</sup>See U. S. D. A. Bu. of Agr. Econ. Serv. and Regulatory Announcement 154.

be less. During the picking season the development of color of red varieties may double over a period of 1-2 weeks and the size may increase 10 per cent or more, depending on the weather.

**Days from bloom.**—Emphasis has been placed recently in some eastern states on the possibility of ascertaining the picking maturity of apples by counting the number of days from full bloom. It is doubtful whether it could be relied upon in the central states where the weather, especially temperature and rainfall, vary greatly from year to year. Records of this kind indicate, however, a general sequence in harvesting the various varieties, which is not always observed by growers.

In general, Grimes and Golden Delicious often are picked too early, while Jonathan and Delicious are harvested too late. This undoubtedly is due to the fact that the market value of the last two varieties is increased appreciably by the development of red color. Timing of harvesting of Delicious is especially important. When picked too early, it is of poor quality; when too late, it becomes mealy. Rome and Stayman apples, when harvested too green, scald badly in storage, and Jonathan and Golden Delicious shrivel easily.

### Selective Picking

“Spot” picking, or harvesting the outside larger and better colored fruit first, has been found desirable and profitable by some experienced apple growers in Missouri. The smaller inside specimens are left to size-up and develop more color. A second picking is made a week or 10 days later depending on the variety and the weather. It is certainly a matter of good judgment to remove first the fruit that may be reached from the ground before ladders are placed against the trees. This will prevent the knocking off of many apples from the lower limbs, especially if the fruit is falling readily.

When apples are intended for prolonged storage, some believe that it is desirable to take care first of the crop on the younger and the lighter bearing trees. This fruit is said to be of poorer storage capacity; scald worse, break down more readily, and in general does not keep so well. If possible and desirable these apples should be segregated from the rest of the crop, sold locally or else stored for a relatively short period.

### Use of Preharvest Sprays

Fruit growers are familiar with the fact that before apples attain a desirable size, color, and maturity, there usually occurs a “natural” drop. With some varieties, like Jonathan, and in some years with most varieties, the drops may be extremely heavy and the loss to growers considerable. While a portion of these windfalls, if in

good condition, may be marketed in one way or another, most of the grounded fruit undoubtedly have to be designated as "Culls". There is seldom profit in the sale of drops. Moreover, such "poor" fruit have an unfavorable effect on the consumption of apples in general.

The recently developed preharvest sprays are very effective in preventing or reducing these late drops. Several commercial spray materials are on the market now under various trade names. They are either in powder or liquid form. The effective ingredient in all of them is naphthalene acetic acid or a derivative. This active substance in the diluted spray should be kept, as per manufacturer's directions on the package, at the dilution of .001 per cent. Substances that are effective at so weak a concentration, and so quickly, are of the nature of hormones. Therefore, these sprays are sometimes called "hormone sprays". The rest of the material in the commercial products consists of a solvent and spreader or filler to give it bulk.

The preharvest sprays are desirable and profitable for varieties that are known as bad droppers or at times when a heavy drop may be expected from any variety because of abnormal weather or other reasons. Certainly when high color and proper maturity are desired, one should, by all means, try these sprays on at least such long-stemmed varieties as Jonathan, Delicious, and Rome, on which they have been used most commonly and with good results in the central states. Varieties with short stems, like Grimes, Stayman, York, and Maiden Blush, have not responded quite so well to these drop-preventing sprays.

To obtain satisfactory response, spraying must be very thorough, requiring more gallons per tree than is usually given for a cover spray, or about  $\frac{1}{2}$  gallon for each year the tree is old. The stems of all apples must be wetted completely, especially at the point of attachment to the spur. Short-stemmed varieties naturally are more difficult to cover, which may be the chief reason why they do not react so well to this treatment.

The application must be carefully timed. Spraying should begin promptly as soon as the first drops appear on the ground. The spray becomes effective in 2-4 days; sooner when the temperature is high; and slower when it is low. The effect is usually continuous for 10-14 days, after which dropping may begin again. This, too, depends on temperature. For some varieties, like Jonathan, two sprays may be necessary, particularly when high color is desired and the picking period is prolonged. The first spray should be given at the usual time, when drops have just started, and the second 7 days later.

The chief advantages secured from a judicious use of preharvest sprays are a remarkable reduction in drops, an increase in size,

and a conspicuous improvement in color and finish of the fruit. It has been reported that in case of some varieties a 10-25 per cent increase in size has been obtained because of a 5-10 day delay in harvesting, made possible by the use of such sprays. Opinion is quite unanimous that the color, and thereby the grade of all red varieties, is improved noticeably when picking is postponed. This general improvement of the "quality" of the fruit should help the grower to secure a more desirable price for his product and the consumer to be more satisfied with the purchase.

Certain other possible advantages may result from the use of these sprays. The picking period may be spread out, which will help to solve a likely labor shortage, since a smaller crew may do the harvesting. Spot picking may be eliminated, thus reducing the harvesting cost to some extent. And because the fruit adheres to the tree better, fewer apples will be knocked off by pickers.

One should be aware of the fact, however, that a considerable delay in harvesting will shorten to some extent the storage life of some varieties of apples, especially Delicious. *The preharvest sprays do not prevent maturing of the fruit.*

#### **Selection and Management of the Picking Crew**

In an orchard of some size an experienced foreman, who is placed in charge of the pickers, is necessary for efficient work. It would seem to be even more desirable to subdivide the harvesting crew into groups of 6 or 10 persons with a man in charge of each group. A tactful and interested person is of great value in management of pickers and in harvesting the crop with efficiency and dispatch.

Every fruit grower knows the hardships, if not dangers, involved in hiring an inexperienced picking crew. It is difficult to handle, especially when made up of town people. Some of them may not have previously come in contact with orchard work and even physical labor of the kind required. In hiring such help a certain amount of selection, if possible, should be practiced by the grower in order to avoid trouble. This should be followed by further close observation of the work performed and, if necessary and feasible, the assignment of tasks to persons best suited to perform them.

At the time of writing this, the shortage of labor is one of the serious harvesting problems. This year (1944) above all it will pay to get as much picking equipment together as possible in order to avoid accidents and to obtain satisfactory work. Good ladders, of the three-legged wide-base type, and their proper use will prevent breaking of spurs and branches and reduce fruit shedding. Special picking bags with rigid sides will help greatly to speed up the work and lessen bruising of the fruit. An ample quantity of field boxes should be on hand. Inexperienced pickers should be given explicit information, or still better a demonstration, regarding the best procedure to harvest the crop.



To obtain apples of good quality they must be carefully picked by hand. The fruit should be separated from the spur by an upward turn and twist of the hand. Pulling often takes the stem out of the apple or breaks the spur, both of which are undesirable. When the stem is pulled out an opening is left in the skin for rot organisms to enter and start decay.

### Speed in Moving the Fruit

During the apple harvesting period in Missouri the day temperature is often quite high. Once picked, the fruit should be moved out of the orchard and packed as rapidly as possible. While in the more northern states packing may be delayed for several weeks, this is not possible in our state unless cold storage facilities are connected with the packing house. The writers have seen repeatedly apples becoming quite ripe because of delay in packing and shipping. Such fruit is good only for immediate sale and consumption, for their storage quality is greatly reduced if not gone.

Keeping apples in lug boxes in the shed or under trees for a few days may be practical if the nights are cool and the day temperature is not too high. It is much better, however, to "store" apples on the tree than under it. They ripen much faster when picked and held in the orchard than when they remain on the tree. Most packing sheds are too hot for apple storage. One should be aware of the fact that at 90° F. ripening is 20 times as fast as at 32-35° F., or cold storage temperature. Even at 70° F. most varieties of apples ripen rapidly and may become soft in a few days or weeks.

### PACKING

Proper organization and thoughtful procedure, as regards help and supply of fruit, containers and other equipment are essential in packing of apples. This seems to be particularly true if the crop is relatively large and the packing house facilities are taxed. The more rapidly the fruit can be graded, sized, packed and shipped the better will be its quality and condition. In prompt handling the culls are removed at once. Where infected with rots they spread the disease organisms to sound specimens. Moreover, apples in a relatively hard state are bruised and injured less easily than when they start to soften.

### Cleaning Apples

The present Federal spray residue tolerance of .025 grains of arsenic and .05 grains of lead per pound of fruit is the tolerance requested by representatives of the apple industry. Conscientious growers will, therefore, make every effort to ship only apples which are within that tolerance. The need for and the method of residue removal depends on the spray schedule followed in individual orchards. Although mechanical brushes and wipers render the



Fig. 2.—A modern well-lighted packing house for washing, grading, and packing apples. (Bean Mfg. Co.)

fruit bright and attractive in appearance, tests have proved that they often remove an insufficient amount of the residue. Accordingly, if late season lead arsenate sprays have been applied, washing is the only known method of adequate spray residue removal.

Observation of many lots of washed apples have led us to the conclusion that washing itself does not injure the storage capacity of apples. Where the protective skin covering has been broken by insect, disease or mechanical injury, accelerated decay may be expected after washing.

### Grading

Standardization of quality has played an essential part in the successful distribution of most products of the farm and the factory. "No. 1" apples as independently described by Mr. A might be far different than No. 1 apples described by Mr. B. "U. S. No. 1" apples with specific grade requirements established by the United States Department of Agriculture do, however, mean the same general quality in all trading centers. In spite of isolated evidence cited to the contrary, it is almost universally true that ungraded apples, or apples marked with unknown designations, are discounted in price out of proportion to the possible saving accomplished. Many growers and packers of apples keep handy reference copies of the United States and Missouri grade requirements, obtainable from the U. S. and State Departments of Agriculture. Under conditions which have prevailed in Missouri in recent years, the grade require-

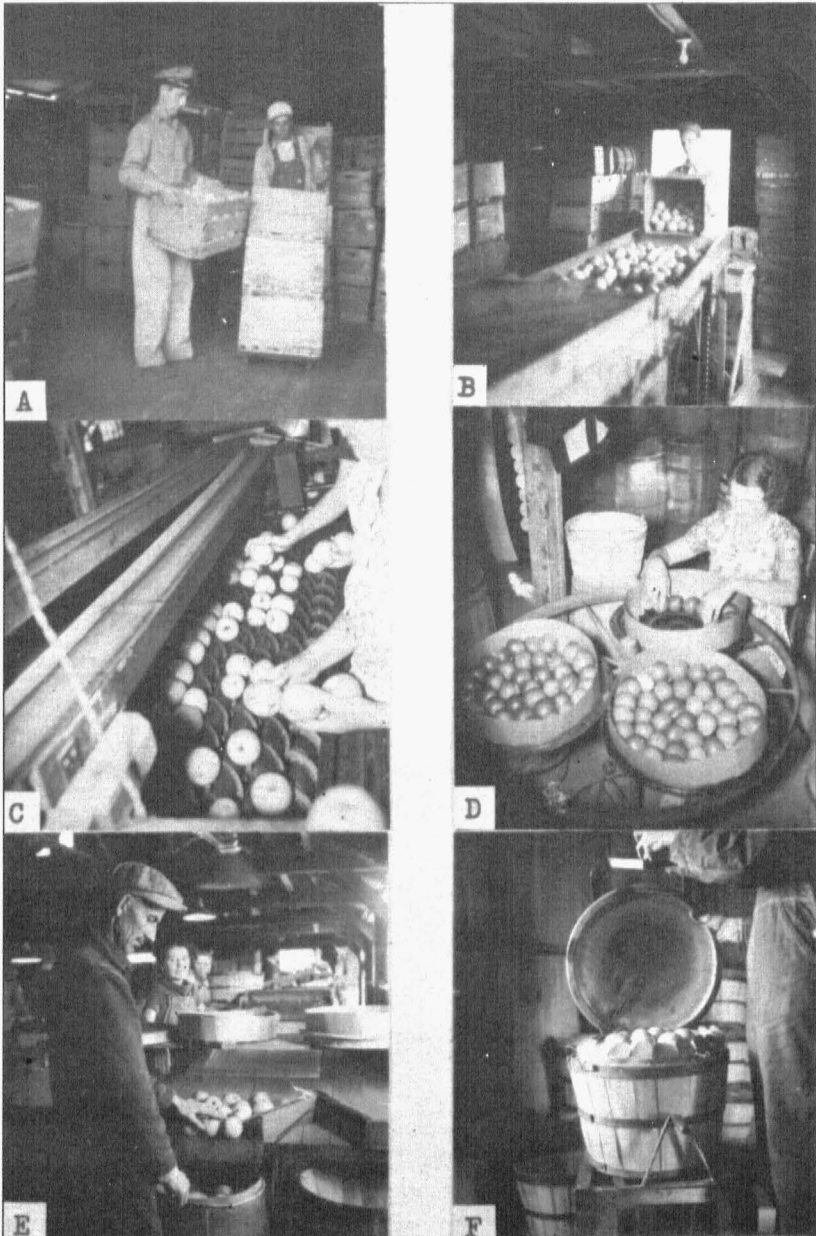


Fig. 3.—Illustrations of some of the chief steps in grading and packing apples. (A) Fruit is moved to grader in lug boxes. (B) Starting the fruit through sizing and grading machine. (C) Rolls facilitate finding of defective fruit. (D) Starting the "ring face". (E) Filling the basket. (F) A finished bushel basket pack of apples.

ment of primary interest and value refers to open worm holes which are not permitted in any recognized grade.

All apples are eventually graded, either by the grower, the wholesaler, the retailer, or by the consumer. The grading may be done, at least cost to the grower and to the industry, at the source of supply, that is, in the packing shed.

Uniform sizing of apples and packing in attractive containers are also of considerable value from the standpoint of consumer appeal. They supplement but will not take the place of graded quality and good condition.

### **Mechanical Injuries to Fruit**

Physical injuries which occur during harvesting and packing operations make up a high percentage of cull apples and of rots on the market. Some of the bruising is done by careless pickers and rough haulers, but probably just as much occurs coincident with grading, cleaning and packing operations.

An extensive packing house survey conducted in Michigan has shown that about 15 per cent of the cull apples was due to cuts and bruises, while a similar survey in Missouri revealed that approximately 10 per cent of culls was due to the same causes. To this must be added many injuries and rots, that, though caused by pressures or punctures of the skin either during harvesting and packing, become visible only when the packages are opened and the product is sold. The fruit being out of his hands, the full effect of the injuries may not be seen by the grower. In some cases as many as 50 per cent of the apples was found bruised. While a certain amount of bruising perhaps is unavoidable, most of the serious damage can be prevented by better equipment and closer supervision of the work. Says a successful grower: "Apples must be picked with care, dropped into the crate with care, hauled in with care, poured into the basket with care, hauled to the storage with care, stored with care, and then hauled to the customer with care."

During the past few years there has developed a tendency to increase the amount of apples in the basket as a sales appeal. When the cover is pressed on an overfilled basket, the top fruit, often the best in the container, are crushed and cut by the lid. This may happen even when a paper pad is used. The injury may be increased still farther by rough and careless stacking of overfilled baskets. The packer may not see the harm done, the dealer may try to overlook it, but the retailer and his customers will see it all right. Boxed apples are often preferred by storekeepers because the fruit have fewer bruises and rots.

The bushel basket has a volume capacity of 2150.4 cubic inches. This is standardized by law. If apples are packed tight, then no extra fruit have to be added to compensate for possible shrinkage

in storage. There is no real reason for overpacking. "Good quality" almost always will outweigh or compensate for "extra measure".

### TRANSPORTATION

For carlot shipments, loading rules adopted by the railroads' "Freight Container Bureau" should be followed. These rules may be secured through the local freight agent of any railroad.

By far the greatest part of the Missouri apple crop is now shipped by truck. Most truckers use creditable care in loading and hauling fruit, with only an occasional careless operator permitting preventable damage. They should be watched.

Baskets of apples should be loaded with the lids up and staggered somewhat in the manner of bricks in a wall. The weight of each basket above the bottom layer is thus distributed on the rims of the supporting baskets and decreases the danger of bruising. Loads should be fully braced or tightly roped to prevent slipping and damaging of baskets and fruit.

During seasons when the days are extremely warm, truck shipments ought to be made at night. If day hauling is necessary, protection against the hot sun may be provided by use of a tarpaulin. High speeds over rough roads should be avoided at all times.

### APPLE STORAGE

The object of storing apples is to prolong their life, so that they can be marketed on a later date when the price may be better because of a reduced supply. The fruit will ripen in storage but at a reduced rate. In general, the lower the temperature the longer it will keep. Fall and early winter temperatures are apt to be too high in Missouri for common storage of apples. Artificial refrigeration or cold storage, therefore, is largely used.

Not all cold storage plants, however, are equally well equipped or managed with the same efficiency. The temperatures in rooms where apples are kept may run all the way from 31° F. to 45° F. or even higher. Growers should be aware of this situation and ascertain the conditions under which his fruit may be stored in a certain plant.

By and large it pays to store till late winter or spring only high quality winter apples, since cold storage at best is quite costly, if cartage and other expenses coincident with the handling of the fruit are taken into consideration. Apples destined for long storage should be sorted and culled carefully. There is often an increased value of good apples after storage, while poor ones may not gain much in price.

### Storage Capacity of Varieties

In storing apples it is necessary to know that each variety has its own inherent storage properties. The approximate cold storage

limits of some of the more important kinds of apples grown in Missouri are as follows: Grimes and Jonathan till December or January; Delicious and York—January and February; Rome and Stayman—February and March; Winesap, Black Twig, Gano, Ben Davis, Willow Twig and Collins (Champion)—May.

### Temperature

The above storage periods for the respective varieties hold true only if they are harvested at the proper time, packed without delay, shipped promptly and kept at or very close to 32° F., which is a desirable cold storage temperature for prolonged keeping of apples. If the temperature goes much above 32° F., it will lead to more rapid ripening and a corresponding decrease in the life of the fruit. At 40° F., for example, most varieties will mature twice as fast as at 32° F. and at 50° F. four times as fast. At still higher temperatures the fruit will lose their crispness and sweet flavor very rapidly. A Delicious apple, for instance, will ripen more in 12 days at 70° F. than in 6 months of cold storage at 32° F.

### Humidity

Not only temperature but humidity also is an important factor in storing fruit. Apples that have lost a comparatively large amount of moisture shrink, become spongy, and the skin shrivels. The desirable humidity in an apple storage room is around 85 per cent. When it is stacked with fruit to capacity humidity of the air will adjust itself to the desired level. All things considered, however, humidity is not nearly as important a factor as temperature in the keeping of apples in cold storage.

### Other Factors Influencing Keeping Quality

There are several other factors that influence the keeping quality of apples. Fruit from young trees or from vigorous trees with a small crop are apt to be relatively large in size and coarse in texture. They keep less well than more average sized apples. It has been suggested previously that they be segregated, sold for earlier consumption or stored for a shorter time. An excessive nitrogen supply or pruning may affect the keeping capacity of fruit.

Picking maturity and speed of moving the fruit into storage, above all, are of paramount importance in storing apples. When harvested and handled right, they will keep well and ripen into a product of high quality. Too early or too late picking will often lead to loss to the grower. Fruit of the Delicious variety in particular should be handled with precaution. When they are harvested too green they are leathery and flat in taste when removed from storage. They turn mealy rapidly when picked too late or not stored promptly.

### Rots and Other Storage Disorders

In storing apples one should not lose sight of the fact that apples, like most other fruit, are subject to many storage rots, especially if they are kept at temperatures much above 32° F. Almost all of these rots are caused by fungi, the spores of which are present where there is fruit grown. Most of the infections take place in the orchard, especially at the time of harvesting. This is particularly true if the fruit is not handled carefully. A puncture of the skin, no matter how small, frequently will give rise to a rot. An infection started during the process of harvesting and packing will continue in storage. The higher the temperature the faster will a rot develop and spread to adjoining fruit. When decay has developed extensively, it may be desirable to repack apples before they are sold.

Of the storage troubles of non-parasitic nature, apple scald is often most troublesome. Certain varieties are more subject to it than others. Grimes, York, Rome, Stayman and Black Twig apples scald readily, particularly when they have been gathered prematurely. Scald can be prevented effectively by scattering among the fruit shredded paper that has been impregnated with mineral oil. Other storage disorders—shriveling, breakdown, brown core, and mealiness—that may affect apples, are traceable to either faulty handling or to too long storage. Overripeness probably is the most serious defect of apples taken out of storage too late in the season and not sold and consumed promptly.

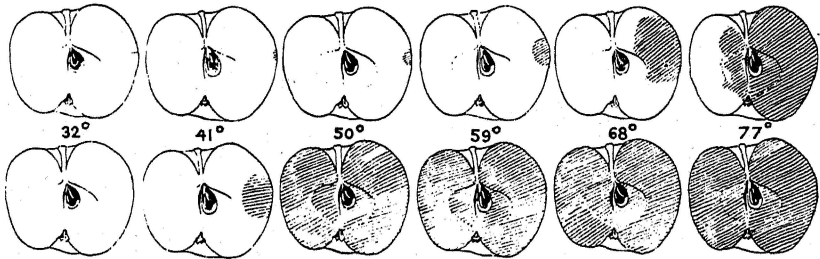


Fig. 4.—The lower the temperature, the slower a rot develops on fruit in storage. Growth of black rot (shaded portion) at various temperatures after 2 weeks in storage (upper drawings), and 8 weeks in storage (lower drawings). (U.S.D.A.)

The grower should inspect his product in storage periodically in order to learn in what condition it is. This will permit him to place on the market apples that can go through the various channels of trade without undue deterioration.

### SELLING APPLES

Missouri grown apples are sold in various ways. The larger orchardists may dispose of their crops through the established trade channels in cities, with or without taking the risk and expense of storage. Established and reputable wholesale or commission dealers are the usual agencies connecting the producing with the consuming centers. The jobbers, knowing the market and sales procedure, usually can do a better job than the growers in disposing profitably of a good sized crop. Growers should always be aware of the fact that on the city markets his fruit will come into competition with apples supplied from other producing regions, including the western states. This certainly is true during the late fall and winter months.

Most apple growers in Missouri have found it profitable to sell all or the major part of the crop during or immediately after the harvesting. Apples in our state mature comparatively early when there is least competition and a good demand for fruit of all kinds.

There are other advantages in selling early most varieties of Missouri apples. The fruit are of the best quality during the first few weeks after they have been picked. When the crop is disposed



Fig. 5.—A simple but well-arranged display of fruit for sale at a roadside market. (Mich. Agr. Exp. Sta.)

of at once the grower takes the least risk of market changes and avoids the cost of storage. There is practically no loss from spoilage and shrinkage. Transportation by truck is much safer and often



more convenient before severe weather sets in. Moreover, the grower receives payment earlier.

Th larger cities, of course, are not the only markets for Missouri apples. Either through truckers or directly, most of our fruit are sold in the smaller towns and in farming sections throughout the state and in adjoining territory. The methods of sale vary greatly, depending on the existing demand, the facilities for transportation and the business acumen of the grower. Almost all of the lower grades and culls may be disposed of locally. To many apple producers direct sales at the time the fruit is harvested are the most convenient and profitable.

It should be emphasized that interest in apples and continuation of sales is best promoted when at least a part of the better grades of high quality varieties is sold at once. The common practice of getting rid of the lower quality apples first for immediate use often leads to disappointed consumers who may turn in large numbers to other fruit and may not return to apples till a well graded and good quality product appears again on the market, mostly from the western states. Local markets are frequently overcrowded with second grade apples early in the fall.

#### **The Wholesale Dealer**

It is a rare, and probably a failing, wholesale dealer who permits sentiment to influence his judgment with respect to the source of his apples. If he buys and sells good quality Missouri apples with success, he does so, not because they are Missouri fruit, but rather because they are good quality fruit. He has found it profitable to handle the product in greatest demand by his jobbing and retailing purchaser.

The responsibility of the wholesaler to the apple industry is discharged if he delivers to his client fruit that is of the same quality and approximate condition as delivered by the grower or shipper. Factors involved are reasonably rapid turnover of stock, adequate warehousing facilities and careful cartage to prevent bruising. The latter factor implies supervised labor.

Apples retained for long periods of time on the dealers' salesfloor or in warm warehouses are subject to serious deterioration. Those not moved during the usual daily sales period should be immediately returned to the coolest available storage room. Careful handling of containers to prevent bruising of the contents is a practice to be constantly encouraged by the manager.

Wholesale dealers are in a peculiarly influential position with respect to apple growers. They represent an important, and sometimes exclusive, source of sales profit to the grower. The latter therefore frequently packs in accordance with requirements specified by the wholesaler. The established dealer, with a continuing interest

in the industry, will request that an apple crop be packed to the highest quality standards consistent with sound economics, considering the average quality on the trees. The fly-by-night operator will insist on overfacing and other subterfuges because his business is not dependent on repeat orders. The wholesaler has an opportunity, and an obligation to the apple industry, to encourage the delivery of graded and honestly labeled fruit. Improved consumer acceptance of Missouri apples is dependent upon confidence as well as upon quality and salesmanship.

### The Retail Dealer

By application of proven methods,<sup>5</sup> the retail dealer may himself be able to reduce the amount of "shrinkage" and "spoilage" in his store, and also serve the apple industry. Apples which show decay or other deterioration should be immediately removed from the sales counter or display package. Produce managers in many of the better retail stores make several inspections each day and freshen up their displays.

**"Shrinkage" and "Spoilage".**—It has been said that "shrinkage" and "spoilage" are the two most important words in the vocabulary of retailers of perishable foods. They are among the major factors which influence his mark-up. On items with minimum shrinkage and spoilage his mark-up or margin may be small. Where the extent of shrinkage and spoilage is large or in question, the grocer will protect himself with a larger margin. This margin increase may be added to the consumer's cost, but is more likely to constitute a reduction in the shipper's price.

For many years the retailers' major complaint against Missouri packed apples has been with reference to the practice of overfacing or "plug-packing" as it is sometimes called in the trade. A few wholesale dealers on some markets still insist on a grossly misrepresentative face. The majority, however, now realize that repeat orders result from quality throughout the package and not from superficial appearance. The apples in the shown face should be reasonably representative of the entire contents in quality, color and size. Under modern mass sales methods, the basket face is seldom visible to the majority of ultimate consumers. In the larger stores, fruit is poured out and displayed in a large flat bin to get a mass effect.

Although mass displays of apples are a proven sales help in the supermarkets and other large-volume stores, their use by small retail units, however, is not popular. Successful mass displays require a relatively large amount of fruit and consequently a rapid "turnover" not usually associated with neighborhood stores. Rather

<sup>5</sup>See Mo. State Horticultural Society publication "Apple Merchandising".

than run the risk of costly shrinkage and spoilage, which result from overbuying, the small grocer will provide the most attractive possible display with a minimum quantity of fruit.

Regardless of legal requirements, which may differ in municipalities and states, variety and grade labeling of retail offerings of apples inspires confidence in the product and in the dealer. Experienced retail produce operators have found that their customers appreciate full labeling and respond with repeated purchases.

### The Consumer

The usual practice among apple consumers in recent years has been to buy small quantities as needed. This is in contrast to the former method of purchasing several bushels or barrels at harvest time and storing them at home for winter use. Along with other factors, this changed buying habit has doubtless helped to make the housewife more critical. She can and usually does inspect each fruit. If she is disappointed in the quality of apples, she has now ample opportunity to eliminate apples from her family diet and turn exclusively to other fruits. Accordingly, the grower, wholesaler and retailer all have a stake in keeping Mrs. Buyer satisfied with her purchases of apples. The grower has by far the greatest stake because he is not in a position to readily change to raising some other product, while the dealers can handle something more suitable and profitable.

In this connection the 1943 "Report of the Committee of Visitors of the Missouri State Horticultural Society" may be quoted:

"Missouri apple growers do not all recognize the necessity of consumer satisfaction if their product is to continue to sell at prices that will return the grower a profit. The consumer ultimately has a choice of buying the produce from a local apple grower or that of a remote grower or the product of growers of some other fruit or vegetable which the consumer can use in the place of apples." . . . "The committee is of the opinion that the sale of ungraded apples, apples which are misrepresented and apples sold to and distributed by a dealer whose business does not depend on satisfied customers, finally result in consumer dissatisfaction that will ultimately be reflected by reduced profits or even losses." . . . "Growers are inclined to attempt to satisfy the trade instead of the consumer."

To improve this inclination, the committee suggests that: "Growers should fully recognize their responsibility to the consumer in regard to the kind of fruit offered, its quality and condition and the package in which it is marketed. A satisfied consumer is the first requisite for a 'Prosperous Commercial Horticulture in Missouri'."

People usually buy what they like and want. They like apples that look and taste good and oftener than not are willing to pay the price. Just "apples" will not satisfy most consumers and will not maintain sales at prices eventually profitable to the growers. It is unsafe indeed to rely upon an old established "liking for apples" for consumer demand. The newer generation of city folks seems to know little of it, as is evidenced by the decrease in per capita purchase of this "king of fruits". Neither is advertising to make them "apple conscious" of much help unless it is backed up by a continuous supply of fruit of really good quality. Missouri can and does produce apples fine in appearance and superb in flavor.

St. Louis Daily Market Reporter, June 20, 1944:

"Moderate increase in receipts of new apples but the supply included some very ordinary fruit. With a broader selection, buyers become more particular as to quality and wide price range resulted. Quality stock remained strong and in demand."