RIPENING FRUIT WITH ETHYLENE

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Recent Development Of Ethylene Gas As A Means Of Ripening Fruit; Character And Action Of The Gas; Methods Of Using

The ripening of fruit with the aid of gases arising from incomplete combustion has been known for a long time by the Chinese who ripened pears by the burning of incense. California citrus growers have used the products of combustion from a kerosene stove for sweetening fruits, for a number of years. However, it has been within the last four years that use has been made of the reacting gas itself.

In 1924 F. E. Denny published the first work setting forth that ethylene was the active agent in the products of combustion from the kerosene stove then used. Since that time the use of the gas has largely displaced the kerosene stove. Although originally developed for ripening citrus fruits its use has spread until it is used in ripening many other fruits and vegetables, especially those brought in from the tropics. Because it has been known for such a short time it is reasonably expected that many more uses will be found for the gas.

Character of the Gas

Ethylene is an unsaturated hydrocarbon having a formula of C2H4. It is a practically odorless, non-poisonous gas, having a density about the same as air. When present in the proper concentration it is explosive and combustible, but since such concentrations are never even approximated in its use, there is no danger from this source. In some cases the concentration at the outlet of the gas in the room is such that an explosion might occur, so precautions are usually taken that no fire be present when the gas is liberated. The gas also has properties as an anaesthetic, but only at high concentrations (about 80%) which are never reached in the curing room.

The exact action of the gas upon the fruit has not been fully determined. The action is essentially the same as the natural ripening process which has been accelerated from 150 to 250 percent. This effect is produced by a catalytic action upon the enzymes present in the fruit. The gas does not itself enter into the reaction. The effect of this action as seen in the fruit is as follows. First, the fruit is blanched, that is, the green chlorophyll present is broken down while the other pigments remain unchanged. This property is perhaps the most useful as it greatly improves the marketable qualities of the fruit. Second, the acid content in some fruits is decreased. There is some conflicting evidence in regard to this. In citrus fruits, little acid change occurs, while in tomatoes a decrease in acid content is evident. Third, the hydrolysis of starch is accelerated, and the more complex carbohydrates are broken down. This action is evident in the partial digestion of the cellulose (woody tissue) in celery and in a possible disadvantage over the old method of bleaching where such action did not occur. Fourth, the sugar content seems to be unaffected. Conflicting evidence is again presented, but the prevailing opinion is that little increase in sugar content occurs. These changes are in general the same as occur in the normal ripening process, modified in some details, depending on the kind of fruit and the condition of the fruit.

The Use of Ethylene

As soon as the value of ethylene in the sweetening of citrus fruits was demonstrated, the growers took up the use of it in preference to the kerosene stove method. Its use in the citrus industry was influenced by the fact that citrus fruits reach maturity before coloration is complete, in many cases. In treating the fruit, an airy, well-ventilated room equipped with heating arrangements so that the proper temperature can be maintained, is necessary. The temperature should be between 70 and 75 degrees for oranges and 60 and 65 degrees for lemons, and the humidity kept as neat 80 as possible. Concentrations of 1-5000 of the gas are then liberated into the room twice daily until the fruit begins to take on the proper color. As coloration will occur after the fruit is removed, it is not necessary to leave the fruit until it is completely colored. The time will vary with the kind of fruit and its condition. Some oranges will color up in two or three days, while lemons often take as long as two weeks.

Ethylene has recently been used in the coloration of tomatoes with satisfactory results. The tomatoes for the winter and spring market are picked green, shipped to their destination, placed in storage, and ripened with ethylene as they are needed. By treating with ethylene an entire carload can be ripened uniformly, which eliminates nearly all the hand labor of sorting out the fruit. The fruit to be treated with ethylene should not be held in storage below 45 degrees as greater breaking down occurs when ripened. Concentrations of 1-1000 are used at a temperature of 65 to 75 degrees for the best results. Ripening usually occurs rapidly, from twelve hours to three days, although in some cases six days, are necessary. Applications of the gas to tomatoes picked in the pink have been successfully undertaken. By applying the gas in the evening a fine, brilliantly colored fruit can be obtained for the local market in the morning.

The celery industry in the northern states has recently taken up the use of the gas and very fine results have been obtained in work done in Minnesota. Formerly it was not possible to grow the more hardy green varieties, because of the difficulty in blanching them. By the use of ethylene for blanching, it is now possible to use these more rapidly growing kinds. Other advantages are that the gas can be applied while the celery is in transit. This means that from ten days to two weeks can be saved in marketing the product. In case of a specially favorable market this fact is quite important.

Ethylene gas may be obtained from several sources at a fairly low cost. At the close of the World War it was being produced at the rate of 500 tons a day for use in the manufacture of mustard gas. Because of this it can be produced cheaply and may be obtained at the present time at the rate of $4.00 for 25 cubic feet. This means that it will cost about 40 cents to treat a car of fruit. The gas is shipped in a specially designed cylinder from which it may be directly liberated into the curing room. After the cylinder is emptied it is returned to the factory to be refilled.

The use of ethylene is a very recent development in the field of horticultural science. Since this is the case it is logical to expect that many more (Continued on Page 11)
IMPROVING DAIRY HERDS

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the herd. If he is from a good family of high producing cows and shows individuality himself it is fairly certain that he is going to be an asset to the herd. Good pure-bred bulls raise the production of the daughters over their dams, as can be shown by the production records.

Too often the bull is bought and used for the mere fact that he is a purebred. He may be faulty in conformation and he may come from a line of purebred cattle that are not a high producing strain. There are many of those bulls that are in reality nothing but purebred scrubs. This type of sire is a knock to the dairy industry. He is not only doing a great deal of damage to the herd in which he is used, but he is perhaps sending to the butcher a good bull that is worthy of being a herd sire.

The herd bull should be well taken care of in all ways possible. He should not be let to run with the herd if definite breeding dates are to be kept. It is always more satisfactory if the dairyman knows the breeding dates as he can then turn dry his cows in time to give them a sufficient rest before calving. It is not always advisable to keep the bull in such a small pen where he can not exercise himself, for exercise is necessary and the dairyman does not exercise him as often as he needs it. He should be fed enough to keep him in good condition but not fat, and green feed and hay occasionally are good for the bull. A clean, thrifty condition of the herd sire is desirable.

An example of good breeding and feeding of home grown grains to an advantage is shown by the records of Noble’s Golden Bessy, a purebred Jersey in the herd of Chesney Farm, Glendale, Arizona. In her first lactation period of three hundred and sixty-five days “Betsy” made 19,508 pounds of milk and 543 pounds of butterfat, and in her second lactation she produced 12,144 pounds of milk and 625 pounds of butterfat. This gives her 25,652 pounds of milk and 1,183 pounds of butterfat for her first two lactations of 365 days each. She holds the Arizona State Records of the Jersey breed for milk and butterfat production in the 365 day division. Junior Two Year Old and Junior Three Year Old. She was also the high cow of the Maricopa County Cow Testing Association for the year 1926-1927. This cow has been handled under ordinary conditions with no special attention.

Business methods in dairying are rewarded as in everything else and the man that uses the records to know his herd, feeds his cows properly, and keeps a good herd sire is the man that is building a dairy herd worth while.

NEBRASKA COW PRODUCE

1,375 POUNDS BUTTER YEARLY

Beauty Girl Gerben Re-Becky, a Holstein-Friesian cow owned by the University of Nebraska, North Plate, Nebraska, has for the third time produced more than 1,000 pounds of butterfat in 365 days. This most remarkable cow last freshened at the age of eight years eleven months eighteen days and thus finishing her record at almost ten years of age. She is credited as having produced 30,137.5 pounds of milk containing 1,104.54 pounds of fat, equivalent to 1,276.8 pounds of butter. She thus attains the great honor of being the second Holstein-Friesian cow in the world to produce 1,000 pounds of butterfat in three successful lactations, her average for the three periods being 30,354 pounds of milk and 1,072.13 pounds of butterfat.

The sire of this splendid animal is King Piebe Pontiac Segis 17403 and the dam is Gerben Re-Becky Segis 352807. Her largest fat production in short time tests is 31.795 pounds of fat from 714 pounds of milk in seven days and 117.408 pounds of fat from 1,328.2 pounds of milk in 30 days. Her best long time record is 1,106.62 pounds of fat from 32,173.8 pounds of milk.

FEEDING VALUE OF ALFALFA

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The crude protein contained in Sample No. 1 exceeds that in Sample No. 2 by 56 percent which gives the higher quality hay a value of $21.85 per ton on the crude protein basis. The digestible crude protein in Sample No. 1 exceeds that in Sample No. 2 by 72 percent which gives it a value of $24.05 per ton on that basis. Thus it will be seen that with these two samples of hay, assuming a fixed price of $14.00 per ton for the protein of the two and using the differences in leaves, crude protein and digestible crude protein only, there is a difference of approximately $2.00 per ton between the leaf and crude protein bases.

The objection that none of these factors can be used accurately in determining the selling price of alfalfa because of the difficulty of determination is a proper one. At the same time, it is well to recall that alfalfa meal is customarily sold on a protein basis at the present time and that it is usually held to fairly accurately describe the quality of the product. For years, the protein content has been an important factor in determining the price of the bread wheats in many markets. Although the actual protein content of hay probably cannot be used, its relation to the leaf content and other factors determining the quality of the product should be well understood.

SUCCESSFUL DATE PACKING

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of quality are taking an increasingly large part in the menu of the household, as dates are becoming better known.

The following table showing the annual production over an eight year period gives an idea of the growth of the industry.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Receipts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>3,500</td>
</tr>
<tr>
<td>1921</td>
<td>36,240</td>
</tr>
<tr>
<td>1922</td>
<td>66,874</td>
</tr>
<tr>
<td>1923</td>
<td>159,182</td>
</tr>
<tr>
<td>1924</td>
<td>196,389</td>
</tr>
<tr>
<td>1925</td>
<td>211,985</td>
</tr>
<tr>
<td>1926</td>
<td>454,000</td>
</tr>
<tr>
<td>1927</td>
<td>625,000</td>
</tr>
</tbody>
</table>

The growth and success of this organization is due primarily to the fact that it is a cooperative organization. The growers by their organization, have established a trade name, which is a great asset. By giving only fruit of quality to the public they have established a market for their produce.

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uses for it will be found in the next few years. It may make possible the shipment of large quantities of tropical fruits every year, thereby opening up a practically new field. Predictions as to its future use are at present nearly all speculations. From recent indications, however, it is likely that the use of the gas at the present time is not a “drop in the bucket” to what it will be in the future.

If sheets are alternated each time after they are laundered, paying no attention to top and bottom, they will wear longer and the strain will be distributed.