of sugar beets. Because of genetic variability in respect to the annual habit, bolters are readily classed as early or fast bolters, intermediate, and late or slow bolters, depending upon the age of the plant at the beginning of seed stalk development.

A seasonal study of the influence which bolting has on root development has shown root weight at harvest to be inversely proportional to the age of the plant at the initiation of seed stalk development. Root weight of early and intermediate bolters remained approximately constant after fertilization, the plants becoming chlorotic and showing evidence of decadence after the seed matured. Indications are that late bolting beets are more vigorous individuals than non-bolting plants, the root weight being greater at the beginning of seed stalk development. This may be true of all bolters but was not determined for the early and intermediate classes.

Intermediate bolting has a pronounced competitive effect on adjacent beets during the period of rapid vegetative growth accompanying seed stalk development. Beets adjacent to early bolters seemingly overcome this competitive influence after decadence of the bolter occurs, while beets adjacent to late bolters apparently are well established before bolting takes place.

A significant lowering of the sucrose percent was recorded during seed stalk development in all classes of bolters studied. This disparity gradually disappeared with cessation of vegetative growth and maturing of seed. Significant differences in apparent purity coefficients were not observed although the purity coefficients were at all times slightly lower in roots from bolting plants.

Cutting the seed stalks 6 to 8 inches above the crowns of intermediate bolters at flowering time had a detrimental effect on the quality of the roots. Thirty-nine percent of the beets succumbed to this treatment, with root decay causing a loss of 27.00 percent in tonnage yields. Sugar synthesis was entirely checked, the sugar content remaining approximately constant throughout the period from June 12 to August 1. However, there was an accumulation of total solids, the apparent purity coefficient being reduced from 81.15 to 50.49 percent.

CONDITION OF STORAGE AND FINAL QUALITY OF SUGAR

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(Read by Title)

Tremendous losses are borne annually by the sugar beet industry because of faulty storage methods. At some factory units the loss has run to more than one hundred thousand dollars in a single year.

Beets placed in storage under ideal conditions have been observed to lose little if any in purity or to become more difficult to process. However, the loss of sugar in long storage under ideal conditions is appreciable toward spring, since nature calls the beet to put forth her leaves in the process of reproduction and she also decrees that in this process the mother beet give up sugar which was stored originally for this purpose.

There are many problems entering into the storage of sugar beets but only those affecting the beet after it is removed from the soil will be treated here.

The most common method of storing beets is in piles ranging from a few feet in width and height, to enormous piles hundreds of feet wide and long and up to 22 feet in height.

Some districts have with varied results stored beets on the grower's farms in piles ranging from one to several hundred tons. Perhaps the chief benefit derived from such methods comes in extreme frost conditions during the harvest. Certainly the loss by evaporation is greater in smaller piles than large piles because of the greater amount exposed to the sun, wind, and frost.

The most serious problem in storing and processing beets in northern climates is frost. In some sections frost occurs almost every night during the harvesting period. Because of the structure of the sugar beet, when the cells are once broken by frost, decay takes place rapidly. This is especially true when the beet is placed in any considerable sized pile or when the temperature suddenly rises above the freezing point. It is a common practice in nearly all districts to segregate for immediate processing any beets that have thus been frosted, however slightly. If a greater volume of frosted beets is received than is possible to process immediately they are usually placed in small piles containing not more than a hundred tons and being not more than eight feet high.

Next to frost in storage beets, trash, leaves, and loose dirt perhaps cause the greatest loss. It has been observed that the sugar beet when placed in large piles in storage for sugar factories goes through a sweat or curing process. They seem to generate considerable heat through this period and if the air passages are obstructed by loose dirt, etc., the problem becomes more complicated immediately. This natural generation of heat for the first few days in storage is greatly complicated by the decay of leaves and other trash. To eliminate the leaves and trash, some manufacturers of piling machinery have introduced reverse roller types of screens. These screens do not remove all the leaves and trash; the problem remains unsolved unless beets are further cleaned by hand as they pass over the conveyor belts leading to the storage piles.

Recent experiences show that wet dirt which adheres to the beet is not detrimental, as heretofore supposed by many, but is on the contrary a decided benefit to the beets while in storage.

Because of the evaporation and the deterioriation of the outside beets of a pile, it appears that a height approximating 22 feet is desirable.

The beets that are harvested dry or allowed to lay in the field exposed to the sun and wind until they are dry, are difficult to keep in satisfactory storage with a minimum of loss. This is because they go into the pile compact and shut off the air from circulation.

Beet sugar manufacturing machinery has been designed and built to handle a perfectly normal beet in the best of physical conditions, which under the most ideal conditions is a complicated process. Therefore the storage of sugar beets to produce as nearly perfect beets at the end of the storage is the goal to be obtained. Death and natural decay set in the moment the beet is removed from the soil and any condition that will hasten this natural process is to be avoided. Frozen beets or overheated beets reduce the sugar content and purity of the juices and are to be avoided if a good quality of sugar is to be produced.

WEED INVESTIGATIONS
by the
California Agricultural Experiment Station

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During the past few years attention has been concentrated on chemical methods of weed control. Research has been directed to the effects, limitations, and applicability of sulphuric acid, carbon bisulphide, acid arsenical, and the chlorates. In addition, study has been made of soil sterilization methods, and a combination of treatments. Most of the results of the foregoing studies have been published, but certain more recently discovered relationships are herewith summarized.

Biological toxicity tests on four California soils show that arsenic toxicity is highest in Fresno sandy loam, intermediate in Columbia fine sandy loam, and low in Yolo clay loam and Stockton adobe clay. Variation from previous tests is explained on the basis of differences in the soil samples.

Repeated cropping of the test cultures showed that arsenic toxicity decreased in all soils until, with the seventh crop, plants in the Yolo and Stockton soils survived in cultures containing 3000 p.p.m. As_2O_3 in the air-dry soil. Differences between the Fresno and Columbia soils diminished. In the seventh run plants survived in both these soils in cultures containing 2100 p.p.m. As_2O_3.

Extensive tests involving short toxicity series in 80 California soils showed that arsenic toxicity can be correlated with texture, being high in sandy soils and low in clays. The most notable exceptions to this generalization are found among the red soils, all of which fix much arsenic and, consequently, act like heavier soils.

Arsenic dosages for soil sterilization in California should be low on coarse gritty soils having little colloidal matter.

Loams, silt loams, and clay loams from acid igneous rocks, or in highly weathered condition from other rock sources, are in the intermediate toxicity range. Also in this group will occur light soils from basic igneous and sedimentary rocks. Clays from sedimentary rocks require heavy applications of arsenic.

The extreme fixing of arsenic by these latter soils may be avoided to a degree by light annual applications of soluble arsenic or by use of arsenic trioxide. (The term "fixation" as used in this work is defined as