

CARE AND PROCEDURES AT HARVEST TIME

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Being able to grow high yields of top quality potatoes is necessary to achieve maximum efficiency in the use of equipment and manpower, and thereby reduce operating expenses and increase profits. Having a high yielding high quality crop does not, however, assure the receiver that the same high quality will be present when the potatoes reach the terminal market. Some of the factors that can result in reduced quality and suggested ways of reducing these detrimental effects will be discussed below.

Early Summer

Environmental conditions and cultural operations are of utmost concern in producing a high quality crop because damage done to the tubers prior to the time they are dug or during the harvest operations can rarely be rectified by even the most careful grading or shipping techniques. During the harvest season in the Columbia Basin extreme variations in temperature are encountered. Temperatures of over 100°F are common in the early potato area around Pasco. High temperatures present serious problems in handling the crop just prior to harvest (after the vines are removed and during harvest). When the vines are removed the ground above the tuber is exposed to the direct rays of the sun. On days of 100°F, the temperature of the soil surface often reaches 150°F. As the soil dries out (during the time the skins are setting) the penetration of heat into the soil is much more rapid than in wet soil and can exceed 100°F for one to three inches below the soil surface. High temperature dehydrates the tubers making them susceptible to internal bruising injury. This high temperature can, if the exposure period is long enough, produce blackheart, a disorder that usually occurs only in storage or during shipment. To keep temperatures low and prevent tubers from drying out the soil should be maintained in a moist condition during the period of skin setting. Skins can be set in fairly wet soil as well as in dry soil, but the time necessary to make grade is usually a little longer. An exception to this rule was found when conducting undercutting studies. It was found that undercut tubers set skins as fast or faster in damp soil than in dry soil. Of course, it must be remembered that in undercutting both the vines and roots are cut off and the tubers will not take up water nor will they dehydrate as long as they are kept in moist soil. Also, under these conditions tubers should set skins rapidly because the soil temperature (60 to 70°F) and the very high humidity near 100% are ideal for the suberization of wound areas and for setting skins on immature tubers. The soil should not be too wet, however, or it may reduce russeting and promote rot. Undercutting can be used to mature a crop in time to meet early high market prices, but certain precautions must be taken. Potatoes should be dug and harvested in two operations due to the fact that loose soil around the tubers following undercutting prevents the use of conventional one step harvesters. Also, once

tubers are undercut the soil must not be allowed to dry out, otherwise, severe dehydration of the tubers will occur. This means that tubers must not be left in the field for an extensive period of time beyond that necessary to set the skins. In the Pasco area where plants were undercut, skins were set sufficiently to meet market grades in 9 to 12 days.

If tubers are close to the surface roto-beating can cause mechanical damage and expose many tubers to high temperatures. Granted, the percentage of exposed tubers may appear to be small, but they will undoubtedly be rejects, and will contribute to rapidly diminishing profits. Reject tubers are created at every step in the harvesting operation and although the number may appear small when each step is considered individually the loss can be tremendous when the rejects at each step are considered collectively.

At harvest time tubers are often dug and picked up in separate operations, especially in the early potato area. This is referred to as an indirect method of harvesting. The direct method of harvesting refers to digging and loading in one operation. When using the indirect method of harvesting care must be taken that diggers do not operate too far ahead of the loader. It has been found that the tissue temperature of tubers exposed to direct rays of the sun for periods of less than 30 minutes can exceed 120°F. Tubers exposed to extremely high temperatures for even a short period of time are likely to rot in shipment or in storage. If temperatures are high and a loader breakdown does occur, partially loaded trucks must be covered and, if possible, trucks should be driven under shade. Similarly, tarpaulins must be tightly tied down for movement of the potatoes from the field to the packing warehouse. Holes in the cover should be quickly repaired because exposure of tubers to wind during movement to the packing house and while sitting in the field or at the packing warehouse results in burned areas that do not heal over. Scraped areas or thin-skinned areas on immature tubers are extremely susceptible to drying out. Unhealed areas are major ports of entry for rot-producing organisms. Even if the tubers do not rot these burned areas will turn brown and reduce the appearance and marketability of the tubers. In areas where high temperatures and hot winds prevail it would be better to harvest in early morning, in the evening, or even at night.

On still, hot sunny days, the sides of steel truck beds that have been standing for long periods in the field waiting to be loaded may reach, and often exceed, 150°F. Tubers coming into contact with hot steel beds will undoubtedly be damaged. The burned areas will not heal over and often become ports of entry for rot organisms. It would help if truck beds were watered down just prior to loading. Harvesting into water truck beds would eliminate this problem all together.

Precooling of warm tubers at the packing warehouse would be beneficial, but certain precaution must be observed. Usually if tissue temperatures can be dropped from 80 or 90°F to 60 or 70°F there will be little initial rise in tissue temperature after the cars are loaded and wound healing will not be impaired.

Late Fall Conditions

Although warm weather is usually not encountered during the latter part of the harvest season, special problems are created by cool temperatures. It has been shown that cool tubers are often more susceptible to internal bruising than warm tubers. Also, when tubers are 40 to 50°F they are extremely turgid and are inclined to split and develop hair checks when bruised. These exposed areas then become ports of entry for rot organisms. Also, at this temperature the healing over of injured areas does not occur or occurs very slowly. The best temperature for wound healing is 60 to 70°F, a temperature not likely to be reached by tubers going from the field directly into storage late in the fall. It is for this reason that extreme care must be exercised while harvesting and handling the fall crops to prevent bruises and cuts from occurring. It is especially important to keep the falling distances as low as possible when unloading trucks into storage cellars. Unblemished matured tubers usually store well without taking special precautions. On the other hand, injured tubers require special treatment to keep well in storage, if they can be kept at all. For best storage, a humidity exceeding 90% is recommended. It is important, also, to remove all rotted, cut, or bruised tubers prior to placing into storage. Removal of loose dirt and debris should be accomplished before putting tubers into storage cellars. Dirt clogs air channels in the pile and reduces the efficiency of ventilation. This may be difficult to do on heavy soils, especially, if the weather is cool and wet.

During unusual cool and wet weather the incidence of rot seems to increase. One source of this problem might be irrigating too heavily. Often a summer rotation system based on a specified number of days between water applications is continued unchanged even though the weather cools. At cooler temperatures the plant does not utilize water at the same rate as it does during warm weather, thereby, allowing the water level in the hills to rise if this rotation is continued. When forced to set in water for extended periods of time tubers will become highly susceptible to water rot. Watering just prior to harvest must be regulated to meet the immediate needs of the plant. Luxury watering can be detrimental.

Harvesting Equipment and Procedures

It is obvious, even to the casual observer, that many trucks and harvesters are in dire need of repairs. Bolts are uncovered, steel sides and bottoms are unpadded, pick-out boards are broken, uneven, or splintered, and links in chain conveyor belts are unpadded, broken, or bent. Tubers coming into contact with defective equipment will be scraped, cut, or bruised.

Handling of the harvester or truck in the field is the most critical of all harvesting operations because it has been shown that almost 70% of all tuber injuries occurring from the time potatoes are dug until they get into the hands of the consumer are caused by digging and by conveying tubers into the truck bed. Chains and moving speeds of both trucks and loaders must be

kept as low as possible and the loading boom on the harvester must be kept close to the load in the truck bed to reduce falling distances. The latter operation is most important when starting a load. Harvesting into water will prevent much of this injury. Skilled and conscientious harvester operators are critical and must be obtained at any cost. Additional wages for the operator can soon be returned by improved tuber quality and by a reduction of lost time.

At the shipping warehouse keep the people doing the unloading from walking on the load. Also, keep the falling distance from the truck bed into the water flume or chain conveyor as small as possible. Hitting the sides of concrete flumes or steel conveyors is a source of considerable internal bruising injury.

Safety of the worker is essential. Keep gears, rollers, and chains shielded. Construct hand rails on harvesters so that workers will have something to hold on to when the loader is rapidly started or stopped. Stop machines when cleaning clogged belts or gears and make workers remove loose clothing or keep it tied down.

I know that much, if not all, of this information has been presented before, but it is extremely important that every grower and shipper be aware of his responsibilities in keeping the potato industry in Washington healthy and profitable. Carelessness by even one grower or shipper can result in a considerable financial loss to the entire basin. One bad load may cause the receivers in a market area to quit buying from a specific production area. Similarly, an extremely good load can result in a sharp increase in orders for a specific area. Bad news travels as fast or faster than good news. In years of good prices such as we have just experienced, careless practices are not as apparent and may be inclined to increase. Damage is often overlooked because of a good demand for the potatoes. This attitude must not carry over to the next year because the demand may be less and then even small discrepancies will be made into major problems. The industry cannot afford, therefore, to get lax in its efforts to do the very best job possible at all times.

It is hard for the people in the production area to realize the extent of damage caused by careless operations because rough handling does not become apparent until many hours after digging. This means that potatoes are either enroute to market, or at the terminal, before their true condition is discovered. It would be a good education for a grower to travel to one of the distant markets to see his own potatoes as they are seen by the receivers. For those who have occasionally gone to the markets to observe one of their rejected cars the usual statement, "I would never have believed they were mine if I hadn't seen them for myself," has much meaning.

Remember -- "Quality begins and often ends in the field."