

1968 BRUISE TESTING REPORT

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An intensive program of bruise testing was undertaken by Sunspiced, Inc. this past harvest season. Records were kept on about 20 growers, and altogether 2,000 samples were taken and tested. A sample consisting of ten tubers was collected from each truckload a grower delivered. The samples were washed in water and dipped in a solution of catechol. The catechol solution was made by dissolving 2 ounces of P-catechol in a gallon of water to which a tablespoonful of spreader-sticker has been added. The samples were left in the test solution for about one minute, and then placed on burlap sacks to drain. Fresh bruises manifest themselves as a red stain. The stained areas were then peeled with a kitchen parer and the degree of bruising rated as follows:

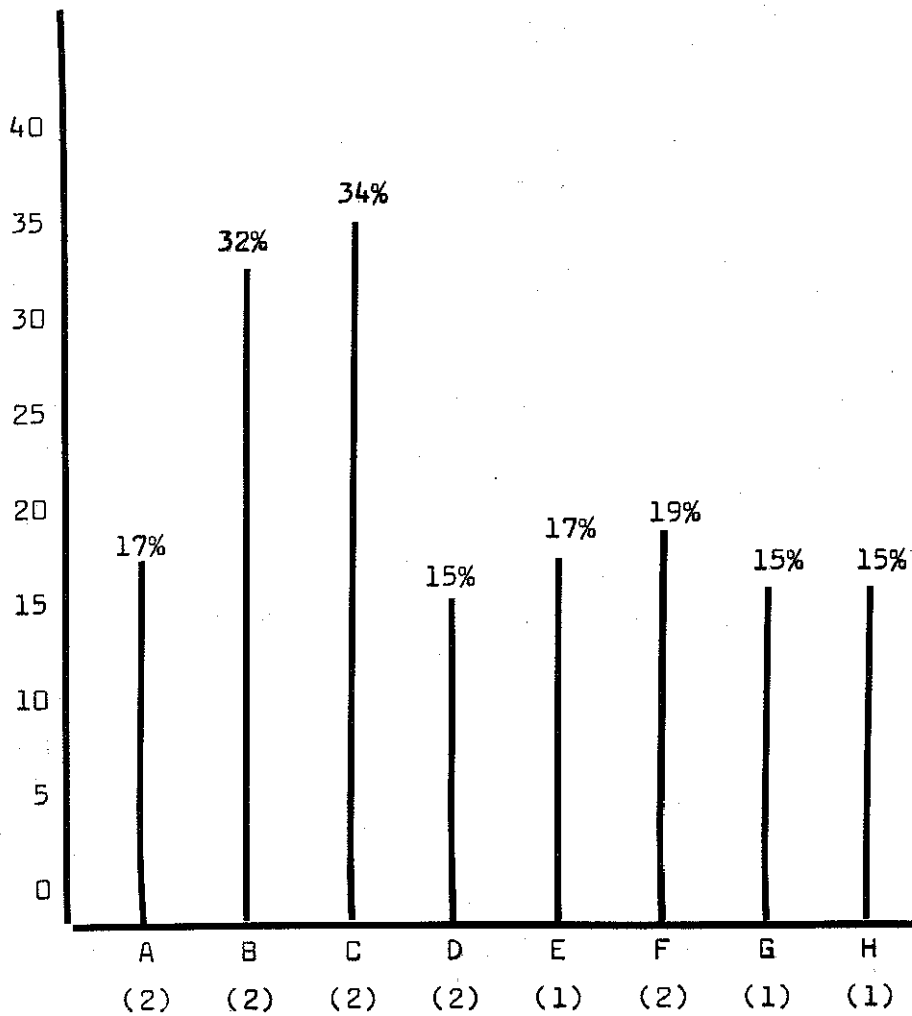
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|---|----------------------|
| 1. No red stain on the tuber | <u>Not Bruised</u> |
| 2. Red stain removed with one slice | <u>Skin</u> |
| 3. Red stain removed with two slices | <u>Slight Bruise</u> |
| 4. Red stain still present after two slices | <u>Severe Bruise</u> |

Catechol is a polyphenol, and in the presence of the enzyme phenolase, which is naturally present in the tuber, it turns dark red to purple after a period of 5 to 10 minutes.

The harvest season is divided into two different periods. The first period from September 30, 1968 to October 7, 1968, was characterized by good temperatures and adequate moisture for digging. The second period October 8, 1968 through November 3, 1968, saw an excessive amount of rain and low temperature. The average severe bruise for the first period was 15%, while the amount recorded for the second period was 23%. The increase is due, in part to the increased use of shaker to remove dirt. Another factor which contributed to an increase in the amount of severe bruise was lack of maturity. A third important reason was increased harvester speeds coupled with low tuber temperatures. Generally speaking, machines with 2 or 3 drops had 14 to 19% severe bruise. Those machines with 4 or more drops averaged from 15 to 34 % severe bruise. Table 1, is a comparison of all machines that were tested.

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Harvest injury can be classified into two general categories; machine operation and machine design. Naturally, these general headings are interrelated, and often difficult to separate. To consider the machine operation first; potato harvest has to begin before the actual date when a

SEVERE BRUISE

Class 1 Machines (3 drops or less) - 15.6% Severe Bruise

Class 2 Machines (4 drops or more) - 23.4% Severe Bruise

Table I

machine is put into the field. Growers have to get ready to harvest. Two weeks before the intended harvest date the vines should be maturing and dying. If they are not maturing they should be killed with one of the various methods used in the area. It is often desirable to roll the hills with a rubber-tired roller to crush the vines. This type of a program has two advantages. First, the rolling will crush the vines to hasten maturity, and second, the rolling will help to seal any cracks in the top of the hill and prevent sunburn.

Adequate moisture at harvest time is a must. Enough moisture must be present to prevent dessication during the time they are maturing. Yet, excess moisture will delay maturity, make it difficult to operate harvesting machinery, and cause a serious problem with respect to separation of the tubers from the soil.

During the past harvest season, which was characterized by cold temperatures and excessive moisture, the most common causes of bruising were the excessive drops within the machine, and excessive speed. Due to the design of the machines it is difficult to vary the drops. The drops can be minimized, however, by carrying a larger volume of potatoes and dirt into the machine. This can be accomplished by increasing the tractor speed slightly, and holding the harvester chain speeds constant. The larger volume of potatoes and dirt through the machine tends to cushion the tubers over the drops. The longer the dirt can be carried with the potatoes in the harvester the more cushioning effect it will have, hence, less bruising.

The height of the elevator boom above the truck bed is critical, and requires operator attention. The ideal drop would be a distance of 4" to 6" and any drop that exceeds this amount will result in an increased amount of shatter bruise.

The evils of excessive speed has been preached many times. When the ground speed is excessive the various chains and elevators are running too fast and the tubers are projected through the air to shatter on each other, or on various parts of the machine. With excessive chain speed comes vibration and "chain gallop" resulting in tubers bouncing and rolling back.

Many growers have but one machine which they may use in several different fields. These fields may be all alike but, as a general rule they are different and will require some adjustments to harvesters. When the other variables of temperature and moisture are also considered the problems of harvest become quite complex. A grower can seldom afford more than one harvester and often finds that the machine he is presently using is incapable of being rapidly changed to meet the changing conditions.

Table 2, is presented to show just what can, and did happen on October 14, 1968. The weather summary shows that .75 inches of rain fell in the 3 days preceding the 14th. The low temperatures during this period were in the mid-thirties. The solid black line shows the amount of severe bruise recorded for the particular machine for October 14, 1968. The hashed line shows the amount of severe bruise recorded as a season average for each machine.

Most of the potato harvesting equipment as it exists today lacks flexibility. The varying conditions of moisture, temperature and soil conditions demands a harvester which can be modified to meet the changing needs. Independent power for the combine by use of a separate power unit, independent hydraulic motors, or a variable gearshift to change the speed of the chains are possibilities. With a power take-off unit, oftentimes, the speed of the tractor cannot be varied without varying the chain speeds within the harvester. While pulleys, gears, and sprockets can be changed on the machine this is a time-consuming operation. If such changes are made, and a different set of conditions are encountered, then more time is consumed in changes.

Limited tests were conducted on potato piling equipment during the 1968 harvest season. In general, the amount of additional severe bruise encountered was between 10% - 20%. Again, the causes of severe bruise in pilers was the same as those encountered in harvesters. Mechanical inadequacies and operator negligence are the two major causes of severe bruise.

Operators are not always adequately **trained** to operate a piler properly. The height of the boom **above the pile** has a direct effect on the amount of bruising that is occurring. Operators should be **cautioned** to keep the hopper as close to the truck unloading belt or chain as possible, to keep the first drop at a minimum. **Coordination** between the piler operator and the truck driver is important to **maintain** a constant even flow of potatoes out of the truck and over the piler into the pile.

It was found during the 1968 season that a variable speed on the piler might be desirable to match more closely the rate of flow of potatoes out of the truck. The unloading speed of trucks varies from one unit to another and this uneven flow causes the piler to overload and spill potatoes on the floor. Too few potatoes coming over the piler cuts down the volume and tends to overemphasize the drops in the piler. Many pilers were found to have too fast a chain speed. Potatoes handled over these pilers were subjected to excessive roll-back and the potatoes were thrown rather than placed in the pile.

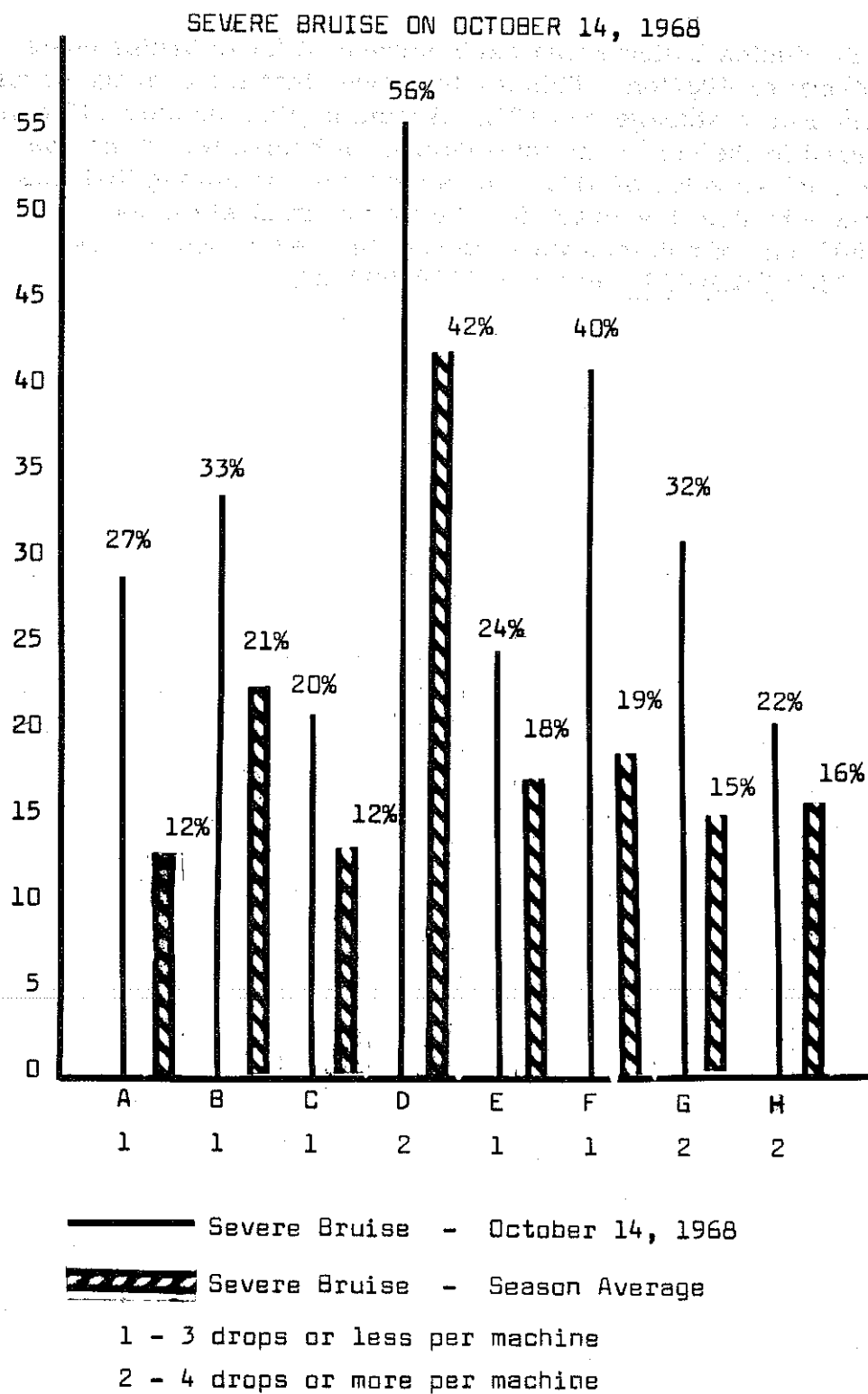


Table II.

Preliminary studies indicate that each percent of fresh bruise costs the grower 2¢/cwt or 40¢/ton. This study showed that the average severe bruise as delivered to storage was 19%. Assuming that another 10% damage was incurred in the cellar the total amount of bruise would then be 29% and have a dollar value of \$11.60 loss per ton. Assuming that this amount of severe bruise is average for the Columbia Basin Area for 1968 and 50,000 tons of potatoes were stored this year; then the loss for 1968, TO THE GROWER, might be \$580,000.00.