EVALUATION OF RESPIRATION AS A TOOL IN PREDICTING INTERNAL QUALITY AND STORABILITY OF POTATOES

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Abstract

The internal quality of the potato going into storage is an important parameter for proper storage management. Unfortunately, a rapid and accurate estimate of this parameter is not available. Respiration analysis has potential to be such a guide. This paper reports work completed during the 1978-79 storage season comparing respiration analysis with the important storage indicators of maturity, dry matter, invert sugars, harvest injury, bruise susceptibility and weight loss. Harvests were made at biweekly intervals over a ten-week period. Samples were evaluated in the respirometer for ten days, then placed in storage at 6°C for six months. Following storage, respiration and invert sugar analyses were reported. Evaluations of bruise susceptibility were made on each harvest date and bruise evaluation of several different harvesters made on the last date. The treatments with the highest invert sugar content and greatest weight loss also had the highest respiration rates.

Resumen

La calidad interna de los tubérculos de papas que serán almacenados es un parámetro importante para un manejo apropiado del almacenamiento. Desgraciadamente no existe un método lo suficientemente preciso para estimar este parámetro. El análisis de la respiración posee potencial para servir ese propósito. Este informe fue realizado en base a los trabajos finalizados en la estación de almacenamiento de 1978-79 en el que se compararon análisis de respiración con aquellos indicadores importantes de almacenamiento, tales como madurez, materia seca, azúcares reductores, susceptibilidad a daños durante la cosecha y pérdida de peso.

Durante un período de diez semanas, se efectuaron cosechas sucesivas a intervalos de dos semanas. Las muestras cosechadas fueron evaluadas en el respirómetro por diez días y luego almacenadas a 6°C por seis meses.
Introduction

Knowledge of the proper storage environment to promote healing and to maintain quality in storage has greatly extended the storage period and increased the value of the stored potato. Further gains could be made if the potatoes going into storage could be assured of being bruise free and of good quality. Bruise reduction programs have had a significant effect on improving the internal quality of the tubers. However, a reliable and rapid method of identifying those tubers with the best potential for long-term storage has not yet been found. Bruise evaluation techniques utilizing external bruise identification have been found to have little value when compared to methods where the tuber is peeled before analyzing for internal quality. Internal quality evaluations using peeling also have limitations including: 1) the storage time required before bruise is evident; 2) determinations are limited to quality factors related to visible damage.

A method of predicting internal quality and storability of potatoes would be of inestimable value to the industry. It could serve for scheduling potatoes into and out of storage and improving operation of storage environmental equipment. It would benefit studies on varieties, fertilization, pesticides, disease, and irrigation by adding a storability factor to the analysis.

While such a method is not now available, the potential exists through respiration analysis. Respiration, the process by which plants obtain energy, is accompanied by a release of carbon dioxide and heat. The familiar heat of respiration is removed in storage by ventilation. Measurement of respiration involves measuring the CO₂ evolved per unit weight and time, usually expressed as mg CO₂/kg hr.

Review of Literature

Respiration rates are affected by many growth and environmental factors, potentially the same factors which affect tuber storability. Respiration measurement is not a new technique but has been used on many crops for determination of optimum storage environmental conditions. However, a review of the American Potato Journal for the past ten years revealed only three articles where respiration analysis had been used on potatoes.