



Harvesting and storage

In this issue, we first highlight three scientific papers that examine potential tools to assist during harvesting and storage of potatoes. Secondly, two articles from the magazine "Potato Storage" (Autumn 2008) are summarised.



The first paper (Al-Mallahi et al.) describes a study that used a RGB colour camera to scan potato tubers and soil clods at different wavelengths and under wet or dry conditions. It was found that the two classes of objects could be discriminated with 99% success at 480 nm under wet conditions. Under dry conditions, another waveband at 752 nm gave a success rate of 95% discrimination.

The second paper (Delaplace et al.) is a review of the numerous methods that have been suggested for use as biophysical, physiological or biochemical markers of physiological age of seed tubers. The paper contends that current biophysical markers are not reliable. Some of the proposed physiological markers appear to be satisfactory but they are not predictive, while the biochemical studies have often been done at specific developmental stages so do not provide information in relation to overall physiological reference frames. An integrated research strategy is recommended for studying potato tuber ageing.

An experiment that was conducted over 2 years, using 380 'Superior' and 'Atlantic' tubers weighing 100-200 g, is described in the third paper (Jeong et al.). The tubers were scanned by near infra-red spectroscopy (NIRS), stored for 30 days at 20°C, and then the sprout weight was measured. Statistical analysis indicated that there was a strong correlation between the NIRS measurements and sprouting, and this relationship was consistent between cultivars and years. The NIRS method is a powerful tool for predicting the sprouting capacity of potato tubers.

Sprout control was the topic discussed under the title "Ethylene does the job" in the magazine Potato Storage (pp. 8-10). The article explains how a UK company has recently been licensed to use ethylene in potato sprout suppression systems, and around the same time "Restrain", a natural anti-sprouting system based on ethylene, has been approved for organic storage of potatoes and onions. Ethylene is a natural plant hormone that degrades into harmless components under light. Its efficacy has been clearly established for sprout inhibition and it is likely to be widely used now that application systems have been designed.

Tartan taters

A Scot currently holds the record for the largest private collection of potatoes in the world. Morris Innes and his wife Ann, of Oldtown, Newmachar, Scotland, have amassed about 720 varieties of spuds, the oldest of which was introduced to New Zealand by Captain Cook in the 18th century. They also have 'Lumpers', which was the variety growing during the Irish famine. Mr Innes is regularly consulted by celebrity chefs and has supplied Prince Charles and other royal households with potatoes. From www.potatonews.com January 2009: News Headline.

In the second Potato Storage magazine article ("Ventilation: something in the air", pp. 12-13), the huge advantages of an effective and efficient ventilation system are described. A good system will not only maintain high tuber quality, both physiologically and in terms of disease control, but it will also keep costs down, as demonstrated by the use of variable frequency drive fans. Paying particular attention to the operation of the potato store will certainly reward the grower, and this includes keeping equipment clean and blocking air leaks from the building.

Discrimination between potato tubers and clods by detecting the significant wavebands. Al-Mallahi et al. (2008) Biosystems Engineering 100: 329-337.

Assessment methods of physiological age of potato seed tuber (*Solanum tuberosum* L.). Delaplace et al. (2008) Biotechnologie, Agronomie, Societe et Environnement 12: 171-184.

Prediction of sprouting capacity using near-infrared spectroscopy in potato tubers. Jeong et al. (2008) American Journal of Potato Research 85: 309-314.



Nutrition

► Effect of cooking on the anthocyanins, phenolic acids, glycoalkaloids, and resistant starch content in two pigmented cultivars of *Solanum tuberosum* L.

For pigmented potatoes (Vitelotte Noire and Highland Burgundy Red), cooking treatments (boiling and microwaves) caused no changes in the phenolic acid content and only a small decrease (<30%) in anthocyanins, compared with fresh tubers. The digestibility of starch and the amount of resistant starch were affected by both cultivar and heating. *Mulinacci et al. (2008) Journal of Agricultural and Food Chemistry 56: 11830-11837.*

► **Positioning the potato as a primary food source of vitamin C.** Vitamin C, also known as ascorbic acid, has a wide range of functions in the human body and is known to decrease the likelihood of a number of important diseases such as cancer, strokes, cataracts and hypertension. Worldwide, vitamin C intake is considered inadequate, even among some people in developed countries. In Europe potatoes contribute about 20% of the dietary intake of vitamin C. Thus, any improvement in the vitamin C content in tubers will have a major impact on human nutrition. There are three main ways of achieving higher vitamin C levels in potatoes: breeding (there is a wide range of vitamin C levels amongst potato breeding lines), improved crop management (particularly the final growth stages in the field and during storage) and modification of cooking processes (to reduce the degradation of vitamin C that results from exposure to moisture, heat and air). *Love & Pavék (2008) American Journal of Potato Research 85: 277-285.*

► **Microorganisms that promote antioxidant activity in potatoes.** The research described in this Italian publication was aimed at enhancing antioxidant activity in potatoes. Tubers from plants that had been sprayed before planting with *Pseudomonas proradix* at 60 g/ha had 20% more total polyphenols and ascorbic acid than an untreated control. A second treatment with EKO-prop-4G (a mixture of mycorrhizal fungi, *Trichoderma* and rhizosphere bacteria) at 3 kg/ha did not affect total polyphenols and ascorbic acid to the same extent. *Sacchetti & Neri (2008) Informatore Agrario 64: 31-32.*

Conference - "Potato in a Changing World"

In the middle of the United Nations' "Year of the Potato", the European Association for Potato Research held its 17th Triennial conference in Brasov, Romania, with the theme of "Potato in a Changing World". Some of the papers presented to the conference and published in the journal "Potato Research" are summarised below.

► The first paper (Cunnington) discusses potato storage in relation to the end use of the potatoes, disease control, agronomic factors such as the length of time the crop spends in the ground, computerised control systems and in store application of chemicals for disease control and sprout inhibition. Enhanced management and control can be obtained through computer systems, but to be effective they must be simple to operate. PCR diagnostics is a new technology that can accurately identify likely storage disease risks at harvest so that appropriate controls can be applied.

► Nearly 10% of the global potato crop is processed into consumer products, such as French fries and potato chips. The second paper (Keijbets) describes the global growth of the processing industry, looks at product diversification, and examines developments in potatoes supply for processing. The paper concludes with a consideration of future challenges and possibilities, particularly in relation to health issues, potential products, sustainability and new cultivars.

► The third paper (Haverkort & Verhagen) reviews climate change, particularly in Europe, and the potential impacts on potato production. In some areas, potato yields will increase, but quality may be affected. In other areas, problems with pests and diseases are expected to increase and control will be more difficult, particularly if rainfall becomes more erratic. The industry will need to adapt with new technologies, such as more flexible potato production equipment, new varieties, expanded pest and disease control strategies, and improved storage facilities.

► The fourth paper (Kapsa) reviews the effects of climate change specifically on pathogens and pests that are potentially a significant threat in potato production. The paper also examines integrated crop protection practices for potato and how they apply throughout the whole crop life cycle, beginning before planting.

► There has recently been much discussion in the literature about various nutritional aspects of potatoes, with both positive and negative findings. The fifth paper (Haase) discusses three important nutritional components of potato: carbohydrates, toxins and antioxidants. For example, the large amount of rapidly

Research summaries continued

available starch in potatoes may contribute to a high glycaemic index, depending on the variety and cooking method, and this would not be recommended for some dietary requirements. In addition, potatoes may contain toxins, either natural (e.g. glycoalkaloids) or food-borne (e.g. acrylamide). On the positive side it is now being recognised that potatoes contain significant amounts of health-promoting antioxidants.

►The sixth paper (Brown et al.) investigated the phytonutrients found in potato that contribute to the human diet. These include carotenoids, which are highest in yellow to orange-fleshed varieties, and anthocyanins, which are present in largest amounts in red- or purple-skinned and fleshed varieties. The effect of cooking on antioxidant levels was also studied, with variable effects found due to the potato variety and the method of cooking. In particular, boiling appeared to increase antioxidant activity in some varieties.

Developments in potato storage in Great Britain.

Cunnington (2008) Potato Research 51: 403-410.

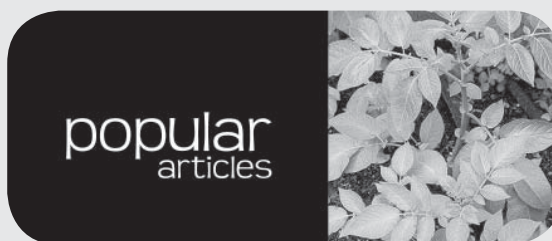
Potato processing for the consumer: developments and future challenges. *Keijbets (2008) Potato Research 51: 271-281.*

Climate change and its repercussions for the potato supply chain. *Haverkort & Verhagen (2008) Potato Research 51: 223-237.*

Important threats in potato production and integrated pathogen/pest management. *Kapsa (2008) Potato Research 51: 385-401.*

Healthy aspects of potatoes as part of the human diet. *Haase (2008) Potato Research 51: 239-258.*

Variability of phytonutrient content of potato in relation to growing location and cooking method. *Brown et al. (2008) Potato Research 51: 259-270.*



www.spudman.com

►**Potato Outlook 2009.** Despite the economic climate, the basic law of supply and demand is expected to still apply to agricultural commodities such as potatoes in the USA. As long as there is not an oversupply, potato prices should be reasonably stable. Generally, recessions do not hit agriculture as much as other markets. However, potato growers are being encouraged to keep good records of their crops so that they can manage them efficiently, and it is also important to control expenditure tightly.

January 2009, p. 16.

Snippets from www.potatonews.com

Listed below is a small selection of the articles that are posted on the Global Potato News website. Please visit the site for further details or follow the links that are indicated.

►**Biofresh ethylene unit installed in Japan following successful trials.** UK company Biofresh has installed an ethylene system that delays tuber sprouting for Tomten Limited, a Japanese company. The trials that resulted in the order for the system created widespread interest amongst Japanese users, and more orders are expected. *October 2008: News Headline.*

►**United Kingdom: Desiccation sprays on target.** The new John Deere 5430i self-propelled sprayer was used at an East Anglian Potato Event to demonstrate how angled Syngenta Potato nozzles achieve excellent targeting of lower leaves and stems and all-round coverage of the plant when applying Reglone for crop desiccation. It was explained that correct setting of nozzle direction will help reduce spray drift, and it is also important to position the sprayer at 50 cm above the crop. Water volume research has shown that 400 litres/ha can improve penetration of foliage for very thick crops, but 200 litres/ha is sufficient for less dense foliage. *October 2008: News Headline.*

43

March 2009



chips



► **Cultivation practices at the root of poor crop development.** At the East Anglian Potato Event, Mark Stalham of Cambridge University Farms outlined how potato growers could improve root penetration and ultimately crop yields by careful application of cultivation practices specifically designed for the soil type and current soil condition. For example, while ploughing is an essential tool on some soils and for certain situations, on fine loamy and sandy soils where there is little inherent structure, a less intensive cultivation schedule may be more effective. This could consist of a simple cultivator pass on cereal stubble in autumn, followed by a bed-forming and destoning pass before planting. In addition, waiting 24-48 hours for soils to dry out before beginning cultivation can prevent smearing and formation of a pan that will limit root growth. Growers need to become more informed about their soils and utilise this information when making management decisions. *Feature Article: September 2008.*

► **Climate change – can potato stand the heat?** Potatoes are now being produced at greater latitudes and higher altitudes than in the past, and some predictions indicate that yields may decline by up to 30% due to climate change effects. Potato is a particularly vulnerable crop due to its requirement for mean daily temperatures of 18-20°C and night-time temperatures of less than 15°C. However, elevated CO₂ levels may actually benefit potatoes, as research has shown that this stimulates the development of underground biomass. Under predicted climate scenarios, diseases like late blight may become more prevalent and water stress could have large impacts on yield due to irregular rainfall and higher transpiration rates. The immediate and urgent challenge for researchers is to incorporate “climate tolerance” traits into new potato varieties. The full article is available at <http://www.new-agri.co.uk/08/05/focuson/focuson2.php>. *Feature Article: October 2008.*

► **ENDURE practical guides for agricultural advisers and extension services on tackling late blight.** The ENDURE programme brings together more than 300 researchers in agronomy, biology, ecology, economics and the social sciences from 18 organisations in 10 European countries. The four late blight guides recently produced from the programme have been jointly written by scientists from Denmark, France, Italy, The Netherlands and Poland. They tackle different aspects of combating late blight and can be accessed at http://www.endure-network.eu/diversifying_crop_protection/latest_news/potato_late_blight_a_4_billion_problem. *Feature Article: October 2008.*

► **Global: Changing consumer tastes explored at upcoming World Potato Congress.** The World Potato Congress is being held in New Zealand from 22-25 March 2009. Lauraine Jacobs, who is a world-renowned food writer and the editor of Cuisine magazine, is speaking on changing consumer tastes and what this means for the potato. The theme is “Nourishing Our Future” and the congress includes presentations on developments in crop management, environment and energy issues, food and non-food processing, consumer trends and food safety and quality. For a conference programme or to register, visit <http://www.wpcnz.org.nz>. *December 2008: News Headline.*

► **Australia: Australian chemist closes in on potato scab toxin.** Researcher Peter Molesworth, of the University of Tasmania’s School of Chemistry, is close to synthetically producing thaxtomin, the compound that causes potato scab. This will allow a detailed study of how the disease works, which then opens up opportunities for finding out how to manage or control the disease. Potato scab does not reduce crop yield, but causes unsightly black and brown holes in the tubers. A potential use for the synthetic thaxtomin will be spraying it on to potato breeding lines to see which ones may be more resistant to the disease. In addition, thaxtomin has shown potential as a “natural herbicide” as it degrades cellulose. *December 2008: News Headline.*

► **Australia: Victoria potato growers move closer to quarantine clearance.** Potato growers in Thorpdale, south-east Victoria, have devised a management plan for potato cyst nematode, which should help them to have an interstate ban on their produce lifted. The area was quarantined when the pest was found on a single farm. Five other five farms near the original outbreak have been tested and are free of the pest. *December 2008: News Headline.*

► **Northern Ireland: Northern Ireland spuds are on the road to Morocco.** A Northern Ireland delegation visited the site of the Seed Potato and Variety Trials in Morocco and was pleased with the interest shown by Moroccan officials. The trials include varieties and seedlines from a number of Northern Ireland companies along with those from collaboration with researchers in New Zealand. The quality of the Northern Ireland varieties was exceptional, with some out-performing the competition. *December 2008: News Headline.*

