MARDI Res. J. 23(1) (1995): 99–102

Short communication:

Sensory characteristics of French fries from six potato varieties

(Ciri-ciri nilai rasa kentang jejari daripada enam varieti ubi kentang)

H. A. Hasimah*, J. Mohd. Yunus** and M. Y. Rafiah Hasanah*

Key words: potato, variety, temperature, sensory, French fries

Abstrak

Kentang jejari telah disediakan daripada enam varieti ubi kentang tempatan yang disimpan pada suhu 5 °C dan 10 °C selama 100 hari. Penilaian rasa telah dijalankan terhadap ciri warna, tekstur dan penerimaan keseluruhan kentang jejari. Untuk kentang jejari yang dibuat daripada ubi kentang yang disimpan pada 5 °C, warna, tekstur dan penerimaan keseluruhan berbeza secara ketara untuk varieti. Untuk kentang jejari yang dibuat daripada ubi kentang yang disimpan pada 10 °C, hanya tekstur berbeza secara ketara untuk varieti. Pada 5 °C, skor purata tertinggi bagi tekstur dan penerimaan keseluruhan telah dicapai oleh Diamant. Pada 10 °C, Diamant juga menunjukkan skor purata tertinggi bagi warna, tekstur dan penerimaan keseluruhan. Antara enam varieti tempatan, Diamant varieti yang paling baik untuk penghasilan kentang jejari.

Abstract

French fries were prepared from six locally-grown potato varieties stored for 100 days at 5 °C and 10 °C. Sensory evaluation on the French fries assessed their colour, texture and overall acceptability. Colour, texture and overall acceptability of the French fries made from potatoes stored at 5 °C were significantly different for the varieties. Only texture of French fries made from potatoes stored at 10 °C was significantly different. At 5 °C, the highest mean score for texture and overall acceptability was obtained by Diamant French fries. At 10 °C, Diamant also scored the highest mean for colour, texture and overall acceptability. Diamant is the best of the six locally-grown varieties for producing French fries.

Introduction

Potatoes (*Solanum tuberosum* L.) need to be stored at a suitable temperature after harvest to minimize sprouting, withering and spoilage to ensure a continuous supply of potatoes throughout the year. The recommended storage temperature for seed and table potatoes is 3.3–5.5 °C. However, potatoes for processing into French fries within a few months of harvest are recommended to be stored at 4.4–10 °C because the dividing line between relatively high and low sugar content occurs within this temperature range (Feustel and Kueneman 1967; Smith 1977). The rate and extent of increase in total and reducing sugars become greater with reduction in temperature. Sprout growth, however, is minimal below 4.4 °C. A high total sugar content, primarily reducing sugar, is known

*Food Technology Research Centre, MARDI Serdang, P.O. Box 12301, 50774 Kuala Lumpur, Malaysia
**Techno-Economy and Social Studies Division, Headquarters Station, MARDI Serdang P.O. Box 12301, 50774 Kuala Lumpur, Malaysia
Authors' full names: Hasimah Hafiz Ahmad, Mohd. Yunus Jaafar and Rafiah Hasanah Mohd. Yusof

to cause the undesirable dark brown colour of crisps and French fries (Anon. 1980; Brown et al. 1990). As the optimum temperature needed for long-term storage and the processing quality of potato tubers vary with variety, it is critical to determine a suitable storage temperature for locally grown potatoes to prolong the storage life before retailing and processing into French fries.

Preparation of French fries

Six varieties of potatoes, namely Cardinal, Desiree, Diamant, Farmosa, Kondor and Monalisa grown in Cameron Highlands, were harvested at commercial maturity, washed, dried, cured (for wound healing and maturation) by leaving the potatoes at 28–30 °C for 7 days and then stored at 5 °C and 10 °C (r.h. 85–90%). After 100 days of storage, the potatoes were processed into French fries.

The potatoes were peeled, washed and sliced into long strips of 1 cm square cross-section. The strips were blanched in boiling water for 8 min, tossed and fried in palm olein (1:4) for 7 min at 190 °C. Each variety was assessed separately where samples from the two storage temperatures were simultaneously fried and served to panelists within 3 min of frying. The French fries were evaluated for colour, texture and overall acceptability by 10 sensory panelists.

Data analysis

The experimental design used in data analysis was a randomized complete block design with panelists as the block and variety as the treatment. The results for the two different storage temperatures of 5 °C and 10 °C were analysed separately. Duncan's Multiple Range Test (DMRT) was employed to detect differences between treatments (Gomez and Gomez 1984; Hochberg and Tamhane 1987).

Sensory characteristics

The effect of variety on colour, texture and overall acceptability of French fries was significant (p <0.05) at the storage temperature of 5 °C *(Table 1)*. However, it was only significant (p <0.05) for texture at 10 °C. Colour differences due to the effect of variety were detected by panelists on French fries made from potatoes stored at 5 °C but not at 10 °C.

At 5 °C, the highest mean score for colour was obtained for French fries made from Desiree potatoes followed by Cardinal, Kondor, Diamant, Farmosa and Monalisa.

Table 1. Mean scores for French fries prepared from six potato varieties stored at two temperatures

Variety	Colour		Texture		Overall acceptability	
	5 °C	10 °C	5 °C	10 °C	5 °C	10 °C
Desiree	6.6a	6.2a	4.7b	5.5abc	4.8b	5.1b
Cardinal	5.5b	6.1a	6.0a	6.4ab	5.7ab	6.0ab
Kondor	5.4b	5.7a	4.5b	4.8c	4.6b	5.3b
Diamant	5.2b	6.5a	6.3a	6.8a	6.2a	7.0a
Farmosa	5.1b	6.2a	5.3ab	5.3bc	5.5ab	5.2b
Monalisa	3.1c	5.9a	5.1ab	5.3bc	4.4b	5.6ab
Standard error of mean	0.36	0.51	0.40	0.46	0.44	0.47

Mean values in each column with the same letter are not significantly different by the Duncan Multiple Range Test at 5%

Sensory evaluation scores were described by using a 9-point hedonic rating scale ranging from 1 (dislike extremely) to 9 (like extremely) (Larmond 1977)

At 10 °C, the highest mean score for colour was obtained for French fries made from Diamant. Panelists also found the colour of French fries made from the Monalisa variety stored at 5 °C unacceptable. The mean colour scores of the French fries made from Cardinal, Kondor, Diamant, Farmosa and Monalisa stored at 5 °C were lower than those made from potatoes stored at 10 °C. This indicated that these five potato varieties were less resistant to low temperature and favoured 10 °C. This is because different varieties differ in their capacity to form reducing sugars in storage which in turn affect the colour of the fried product (Walkof and Chubey 1969; Anon. 1980). All the six potato varieties stored at 5 °C contained higher levels of total sugars and total soluble solids than in the samples stored at 10 °C (Abd. Shukor et al. 1989). This accounted for the darker coloured French fries and hence lower colour scores in the French fries made from Kondor, Diamant, Monalisa, Farmosa and Cardinal stored at 5 °C. This was consistent with the findings of Lammerink (1989) on five potato varieties stored at 6 °C and 11 °C for 25 weeks, where it was reported that the colour of French fries darkened more rapidly to unacceptable levels for all cultivars at 6 °C.

At both 5 °C and 10 °C, French fries made from Diamant obtained the highest scores for texture as well as overall acceptability.

The study showed that variety influenced the sensory quality of French fries. This is supported by Samotus et al. (1974) and Tantidham et al. (1991) who reported that processing quality of potatoes varies with variety. Based on the overall acceptability of the product, Diamant seemed to be the best variety for making French fries.

Acknowledgements

The authors would like to thank Dr Abd. Shukor, A. R., Norashikin Idris and all MARDI staff who have directly or indirectly contributed to this project. The authors also thank Dr Aminah Abdullah for her invaluable comments.

References

Abd. Shukor, A. R., Ahmad, S. and Hasimah, H. A. (1989). Handling and storage of potato – an overview. Paper presented at Ware Potato Storage Planning Workshop (SAPPRAD), 2 Sept. 1989, Kuala Lumpur, 7 p. Organizer: SAPPRAD

Anon. (1980). Sugar development in potatoes. Extension Bulletin 0717. Washington State University Cooperative Extension and U.S. Dept. of Agric.

Brown, J., Mackay, G. R., Bain, H., Griffith, D. W. and Allison, M. J. (1990). The processing potential of tubers of the cultivated potato, *Solanum tuberosum* L., after storage at low temperatures. II. Sugar concentration. *Potato Research* ***33(2):*** 219–27

Feustel, I. C. and Kueneman, R. W. (1967). Frozen French fries and other frozen potato products. In *Potato processing* (Talburt, W. F. and Smith, O., ed.) p. 345, 347. Westport, Connecticut: The AVI Publishing Co. Inc.

Gomez, K. A. and Gomez, A. A.(1984). *Statistical procedures for agricultural research* 2nd ed., p. 208–15. New York: John Wiley

Hochberg, Y. and Tamhane, A. C. (1987). *Multiple comparison procedures* New York: John Wiley

Lammerink, J. P. (1989). Response of the processing quality of potato cultivars to long term storage conditions. *New Zealand Journal of Crop and Horticultural Science* ***17(1):*** 61–5

Larmond, E. (1977). *Laboratory methods for sensory evaluation of foods* Ontario: Canada Dept. of Agric.

Samotus, B., Niedzwiedz, M., Kolodziej, Z., Leja, M. and Czajkowska, B. (1974). Storage and reconditioning of tubers of Polish potato varieties and strains. I. Influence of storage temperature on sugar level in potato tubers of different varieties and strains. *Potato Research* ***17(1):*** 64–81

Smith, O. (1977). *Potatoes: Production, storage, processing* 2nd ed., p. 436–7. Westport, Connecticut: The AVI Publishing Co. Inc.

Tantidham, K., Panuampai, W., Jirathana, P. and Wiersema, S. G. (1991). Evaluation of potato clones for processing and consumption quality in Thailand. *Proc. Asian Potato Assoc. 3rd Triennial Conf.* 17–22 June 1991, Bandung, Indonesia, p. 62–3. Bandung, Indonesia: Asian Potato Assoc.

Walkof, C. and Chubey, B. B. (1969). Relationship of chipping quality to maturity and storage temperature. *Canadian Journal of Plant Science* ***49(4):*** 453–8

Accepted for publication on 14 September 1994