



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(8): 65-69
Received: 02-06-2026
Accepted: 05-07-2026

All authors' names and affiliations
are given below, after the
references.

Evaluation of post-harvesting behaviour and tuber organoleptic parameters of early maturing hybrids/varieties of potato (*Solanum tuberosum* L.)

Hemant Kumar Meena, Murlidhar J Sadawarti, KV Singh, Deepanshi Deora, Vinod Kumar, Nilesh Ninama, Tanuja Buckseth, Subhash Katare, Rajendra Kumar Samadhiya, SP Singh, Dharmendra Verma, Ramawatar Choudhary, Astha, Abhishek Yadav and Umesh Patle

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i8a.6200>

Abstract

To study the post-harvesting behaviour and tuber organoleptic parameters of early maturing hybrids/varieties of potato in North Central India, a field experiment was conducted at, Central Potato Research Station (CPRS), Gwalior, Madhya Pradesh, during two consecutive *Rabi* seasons (2023-24 and 2024-25). The experiment was laid out with 3 replications comprised of 33 total plots in Randomized Block Design and consist 11 treatments (5 hybrids and 6 varieties). The result revealed that significantly highest initial number of tubers at storage under ambient temperature was recorded in T₅-P-105 (23.67) and significantly highest sprouting percentage of tubers at 60 days of storage was recorded in T₁₀-P-1 (18.59%) and the diversity observed in tuber organoleptic parameters viz. shape, skin color, flesh color, flesh score and type of eyes were results of genetical variability of the hybrids and varieties, that provides useful selection criteria for target specific breeding programmes, market and processing units requirements.

Keywords: Tubers, organoleptic, sprouting%, genetical variability and post-harvesting behaviour

Introduction

Potato (*Solanum tuberosum* L.) ranks as, one of the most important non-cereal tuber crops globally. It belongs to the family *Solanaceae* and valued for both high yield per unit area and adaptability under diverse agro-climate conditions. It is considered top most stable food crop in world, known for supplying energy along with several nutritional components as essential amino acids, high starch & dietary fibre content and fat at low concentration (Tatarowska *et al.* 2023) ^[16]. In potato production, India ranks second just after China. India's potato production reached 58.57 million tonnes in the 2024-25 crop year (Anonymous, 2025) ^[3]. The potato majorly producing in Indian states are Uttar Pradesh > West Bengal > Bihar > Gujarat > Madhya Pradesh > Punjab > Haryana > Assam > Jharkhand > Chhattisgarh (Anonymous, 2024) ^[2]. In Madhya Pradesh, the crop covered 170 thousand ha area, with average production of 3.9 million t and average productivity of 23.0 t ha⁻¹ (Anonymous, 2023) ^[1].

Beyond high production per unit area, potato is nutritionally staple food used and consumed by billions of humans worldwide. A raw potato contains about water (77.46 g/100g), fiber (2.20g/100g), protein (2.02 g/100g), energy (77 kcal/100g), rich source of vitamin-C, potassium, several vitamins-B and carbohydrate mainly in form of starch (Beals, 2019) ^[5]. Despite of its low protein content, potato protein has excellent (90-100) biological value (Camire *et al.*, 2009) ^[6].

In potato production, post-harvest stage is as critical as its agronomic production. After harvesting as tubers remain living it undergo continue physiological changes during storage. The main cause of post-harvest deterioration is sprouting which reduce the marketable quality weight loss and accumulation of glycoalkaloids such as solanine and chaconine, alongside a decline in processing quality (Lohani *et al.*, 2025) ^[13] followed by moisture loss and rotting (Kumar *et al.*, 2024) ^[12]. Hence, evaluating the initial tuber number, tuber weight and sprouting percentage of early maturing hybrids/varieties is essential to assess their true storage ability.

Corresponding Author:
Hemant Kumar Meena
Ph.D. (Research Scholar)
Vegetable Science, Department of
Vegetable Science, College of
Agriculture, Rajmata Vijayaraje
Scindia Krishi Vishwa Vidyalaya,
Gwalior (474002) Madhya Pradesh,
India

Potato's market value not only depend on yield but the consumption quality (visual and sensory) of tubers that determined by the various traits viz. shape, skin color, flesh color, flesh score and eyes types (Arslanoğlu *et al.*, 2011) ^[4]. These organoleptic descriptors viz. shape, skin color, flesh color, flesh score, and eye type, form the standard basis for varietal characterization and for its international registration by following IBPGR's minimum descriptor list for potato genetic resources (IBPGR, 1985).

Therefore, in present study, evaluation of post-harvesting behaviour and tuber organoleptic parameters of early maturing hybrids/varieties of potato (*Solanum tuberosum* L.) provides essential baseline information for identifying genotypes that combine earliness with acceptable market and storage quality.

Materials and Method

During two consecutive *Rabi* seasons (2023-25), an experiment was conducted at Central Potato Research Station (CPRS), experimental area of ICAR field, Gwalior, Madhya Pradesh at storage house. The experiment was laid out with 3 replications comprised of 33 total plots in Randomized Block Design. The 11 treatments consist 5 hybrids viz. P-68, P-79, P-89, P-97 & P-105 and 6 varieties viz. *Kufri Khyati*-C-14, *Kufri Pukhraj*-C-17, *Kufri Bahar* -C-6, *Kufri Badshah*-C-5, *Kufri Mohan*-P-1 & *Kufri Ganga*-P-9.

At physiological maturity, uniform and healthy tubers were harvested from each plot, air-dried after cleaning under the shade and stored in plastic crates under ambient conditions i.e. 25-30 °C of temperature and 70-80% of relative humidity. Healthy tubers selected per treatment, counted and recorded as initial number of tubers and weight as initial weight of tubers at storage and tubers showing visible bud sprout emergence were counted as sprouting (%).

$$\text{Sprouting (\%)} = \left(\frac{\text{Number of sprouted tubers}}{\text{Initial number of tubers}} \right) \times 100$$

With regard to shape, observed visually and shape of tuber recorded. Based on tuber skin characteristics, tubers of each treatment were noted by visual observation immediately after harvesting. Tubers from each treatment were cut into two halves and the assessment of the sample for flesh color was done visually according to the following (1 = White), (2 = Cream) and (3 = Yellow) as described by Wooster and Farooq, (1995) ^[17]. Tuber flesh color was scored by visual observation according to the following (1 = White), (2 = Cream), (3 = Yellow), (4 = Red) and (5 = Dark purple). For eye type of tuber, tubers from each treatment were observed carefully and their eye type visual observation Wooster and Farooq, (1995) ^[17] according to the following (1 = Very deep), (2 = Very deep to deep), (3 = Deep), (4 = Deep to medium), (5 = Medium), (6 = Medium to shallow), (7 = Shallow), (8 = Shallow to very shallow) and (9 = Very shallow) as described by (Wooster and Farooq, 1995) ^[17]. The data was analysed using MS-Excel and OPSTAT. The analysis of variance (ANOVA) was carried out at 0.05 level of significance for comparison suggested by Panse and Sukhatme, (2000) ^[14].

Results and discussion

Initial number of tubers at storage at ambient temperature was recorded significantly highest in T₅-P-105 (23.67), which was statistically at par with T₆-C-14, T₇-C-17, T₁₁-P-9, T₉-C-5, T₁₀-P-1, T₁-P-68 and T₄-P-97 (23.17, 23.17, 22.83, 22.33, 22.00, 21.17 and 21.17, respectively). The lowest initial number of tubers at storage at ambient temperature was recorded in T₂-P-79 (20.17).

Similarly, the initial tuber weight (2.01 kg) remained statistically uniform across all treatments. The non-significant variation at the commencement of storage might be attributed to uniform harvesting stage, grading and pre-storage handling, which minimized genotypic differences immediately after harvest. Initial tuber number showed comparatively greater variability while initial tuber weight remained uniform across genotypes due to the standardized sampling protocol typically employed for storage studies. Wherein a fixed, predetermined quantity of tuber material by weight is uniformly allocated to each treatment for storage evaluation. These findings are in close conformity with the results reported by Deora *et al.* (2025) ^[8], who observed non-significant differences in initial tuber number and weight among potato varieties under ambient storage conditions, while significant varietal differences became evident during later storage due to differential dormancy and physiological behaviour. Similar observations were also reported by Gupta *et al.* (2023) ^[9]. Pooled data of sprouting (%) of tubers at 60 days indicated that significantly highest sprouting was obtained in T₁₀ - P-1 (18.59%), followed by T₈ - C-6 (17.47%), whereas the lowest sprouting was recorded in T₅ - P-105 (6.01%). Some treatments such as T₁ - P-68, T₂ - P-79, T₄ - P-97 and T₁₁ - P-9 did not exhibit sprouting even at 60 days, indicating longer dormancy duration. Tuber dormancy in potato is a genetically regulated physiological state governed primarily by the endogenous hormonal balance within the tuber meristematic tissue particularly the ratio between abscisic acid (ABA), which maintains dormancy by suppressing meristematic activity at the eyes and gibberellic acid (GA), whose progressive accumulation following the natural decline of ABA levels triggers cell division and elongation within the sprout primordia ultimately resulting in visible sprout emergence. Similarly, Suttle (2004) ^[15] observed that the duration of dormancy and onset of sprouting are genetically regulated and influenced by hormonal balance within the tuber. The initiation of sprouting observed at 60 DAS in the present study may be due to the completion of dormancy and subsequent activation of metabolic processes.

The data in Table 3.2 and presented in plate 3.1 and 3.2, related to the potato tuber parameters, i.e., shape, skin colour, flesh colour, flesh score and type of eyes. The result indicates that mostly treatments produced ovoid-shaped tubers viz., T₂ (P-79), T₆ (C-14), T₇ (C-17), T₉ (C-6), T₁₀ (P-1) and T₁₁ (P-9) except T₁ (P-68), T₃ (P-89) and T₈ (C-5) which had oval-shaped tubers, whereas T₄ (P-97) had round-oval shaped tubers and T₅ (P-105) had round shaped tubers. Based on skin colour, the result indicated that mostly treatments possessed white-cream skin colour tubers viz., T₂ (P-79), T₄ (P-97), T₅ (P-105), T₆ (C-14), T₉ (C-6), T₁₀ (P-1) and T₁₁ (P-9) except T₁ (P-68) and T₇ (C-17) which had yellow skin colour tubers, and T₃ (P-89) and T₈ (C-5) which had light yellow skin colour tubers. The result further indicated that yellow flesh colour tubers were observed in T₁ (P-68) and T₇ (C-17), cream flesh colour tubers were found in T₂ (P-79), T₅ (P-105) and T₄ (P-97), light yellow flesh colour tubers were recorded in T₃ (P-89) and T₈ (C-5), white-cream flesh colour tubers were observed in T₆ (C-14) and T₁₁ (P-9), whereas white flesh colour tubers were recorded in T₉ (C-6) and T₁₀ (P-1). It was further observed that yellow flesh colour tubers [T₁ (P-68) and T₇ (C-17)] had flesh score of 2.5 and 3, respectively, cream flesh colour tubers [T₂ (P-79), T₅ (P-105) and T₄ (P-97)] had flesh score ranging from 2 to 3, light yellow flesh colour tubers [T₃ (P-89) and T₈ (C-5)] had flesh score of 2.5, while white-cream flesh colour tubers [T₆ (C-14) and T₁₁ (P-9)] had flesh score of 1.5 and white flesh colour tubers [T₉ (C-6) and T₁₀ (P-1)] had flesh score of 1. With respect to type of eyes, shallow to medium eyes were

recorded in T₁ (P-68), T₄ (P-97) and T₇ (C-17), whereas medium-deep eyes were observed in T₂ (P-79), T₅ (P-105), T₆ (C-14) and T₉ (C-6). Shallow eyes were recorded in T₃ (P-89), T₈ (C-5), T₁₀ (P-1) and T₁₁ (P-9). Collectively these qualitative traits governed by the genetic regulation, tuber morphology and inherent genetic characteristics. Tuber shape, determined by the differential rate and direction of cell division and expansion within the developing tuber during the early stolon-swelling phase. Skin and flesh colour governed by the differential biosynthesis and accumulation

of carotenoid pigments, particularly zeaxanthin, violaxanthin and lutein, within the tuber periderm and parenchymal tissue. Eye depth determined by the degree of tuber periderm invagination at the nodal points from which axillary buds arise. Similar varietal differences in tuber shape, skin colour, flesh colour and eye depth were reported by Chaudhary *et al.* (2024) ^[7], who observed high morphological variability among indigenous potato genotypes. Further, Hara-Skrzypiec *et al.* (2018) ^[10], who observed significant genetic variability for tuber morphological traits.

Table 1: Initial number and weight of tubers at storage at ambient temperature as influenced by different hybrids and varieties

	Treatments	Initial number of tubers at storage			Initial weight of tubers at storage			Sprouting % of tuber at 60 days of storage		
		2023-24	2024-25	Pooled	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
T ₁	P-68	19.67	22.67	21.17	2.01	2.01	2.01	0.00	0.00	0.00
T ₂	P-79	21.33	19.00	20.17	2.01	2.01	2.01	0.00	0.00	0.00
T ₃	P-89	20.67	20.67	20.67	2.01	2.01	2.01	14.60	13.50	14.05
T ₄	P-97	23.33	19.00	21.17	2.01	2.01	2.01	0.00	0.00	0.00
T ₅	P-105	23.00	24.33	23.67	2.01	2.01	2.01	6.17	5.86	6.01
T ₆	Kufri Khyati (C-14)	22.33	24.00	23.17	2.01	2.01	2.01	7.65	7.53	7.59
T ₇	Kufri Pukhraj (C-17)	25.00	21.33	23.17	2.01	2.01	2.01	14.51	14.26	14.38
T ₈	Kufri Bahar (C-6)	22.33	19.33	20.83	2.01	2.01	2.01	17.65	17.29	17.47
T ₉	Kufri Badshah (C-5)	21.67	23.00	22.33	2.01	2.01	2.01	9.41	8.90	9.16
T ₁₀	Kufri Mohan (P-1)	22.67	21.33	22.00	2.01	2.01	2.01	18.63	18.56	18.59
T ₁₁	Kufri Ganga (P-9)	23.00	22.67	22.83	2.01	2.01	2.01	0.00	0.00	0.00
	SEm(±)	1.300	1.354	0.939	0.002	0.002	0.002	0.509	0.461	0.343
	CD at 5%	NS	NS	NS	NS	NS	NS	1.500	1.361	0.981

Table 2: Tuber parameters (shape, skin color, flesh color, flesh score, and type of eyes) as influenced by different hybrids and varieties of potato

Treatment	Tuber parameters				
	Shape	Skin color	Flesh color	Flesh score	Type of eyes
P-68	Oval	Yellow	Yellow	3	Shallow-medium
P-79	Ovoid	White-cream	Cream	2	Medium deep
P-89	Oval	Light yellow	Light yellow	2	Shallow
P-97	Round- oval	White-cream	Cream	2	Shallow-medium
P-105	Round	White-cream	Cream	2	Medium -deep
K. Khyati (C-14)	Ovoid	White-cream	White-cream	1.5	Medium - deep
K. Pukhraj (C-17)	Ovoid	Yellow	Yellow	3	Shallow-medium
K. Bahar (C-6)	Ovoid	White-cream	White	1	Medium-deep
K. Badshah (C-5)	Ovoid	White-cream	Cream	2	Shallow
K. Mohan (P-1)	Ovoid	White- cream	White	1	Shallow
K. Ganga (P-9)	Ovoid	White-cream	Cream	2	Shallow



Plate 1: View of/ Shape of potato tuber as influenced by different hybrids and varieties of potato



Plate 2: View of/ flesh colour potato tuber as influenced by different hybrids and varieties of potato

Conclusion

The result revealed that significantly highest initial number of tubers at storage under ambient temperature was recorded in T₅-P-105 (23.67) and significantly highest sprouting percentage of tubers at 60 days of storage was recorded in T₁₀-P-1 (18.59%) and the diversity observed in tuber organoleptic parameters viz. shape, skin color, flesh color, flesh score and type of eyes were results of genetical variability of the hybrids and varieties, that provides useful selection criteria for target specific breeding programmes, market and processing units requirements.

Competing interests

All the author declares that there is no conflict of interest related to this article

Acknowledgement

The authors extend their sincere gratitude to the Scientists of ICAR-Central Potato Research Institute, Regional Station, Gwalior, Madhya Pradesh (474 020) and College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (474002) Madhya Pradesh, India. for providing facilities for conducting research work and their invaluable support and guidance in the completion of the field and lab research experiment.

References

1. Anonymous. Agricultural Statistics of Madhya Pradesh 2022-23. Bhopal: Directorate of Economics and Statistics, Government of Madhya Pradesh; 2023.
2. Anonymous. Indian Horticulture Database 2024. Gurugram, Haryana: National Horticulture Board, Ministry of Agriculture and Farmers Welfare, Government of India; 2024.
3. Anonymous. FAOSTAT, Statistical Database. Rome: Food and Agriculture Organization of the United Nations; 2025.
4. Arslanoğlu FN, Aytac S, Oner EK. Morphological

characterization of the local potato (*Solanum tuberosum* L.) genotypes collected from the Eastern Black Sea region of Turkey. African Journal of Agricultural Research. 2011; 10(6): 922-932.

5. Beals KA. Potatoes, nutrition and health. American Journal of Potato Research. 2019; 96(2): 102-110.
6. Camire ME, Kubow S, Donnelly DJ. Potatoes and human health. Critical Reviews in Food Science and Nutrition. 2009; 49(10): 823-840.
7. Chaudhary B, Dalamu, Gupta VK, Luthra SK, Kumar M. Morphological characterization of indigenous potato (*Solanum tuberosum*) genotypes. The Indian Journal of Agricultural Sciences. 2024; 94(5): 528-533.
8. Deora D, Sadawarti MJ, Naruka IS, Meena HK, Buckseth T, Katore S, *et al.* Effect of sowing time, variety and propagation method on the storage behavior of potato tubers under ambient conditions. Journal of Advances in Biology & Biotechnology. 2025; 28(1): 1-12.
9. Gupta H, Zhawar VK, Sharma SP. Genotype and abscisic acid interaction on tuber dormancy and sprouting during ambient storage in potato. Potato Journal. 2023; 50(2): 112-120.
10. Hara-Skrzypiec A, Śliwka J, Jakuczun H, Zimnoch-Guzowska E. QTL for tuber morphology traits in diploid potato. Journal of Applied Genetics. 2018; 59(2): 123-132.
11. International Board for Plant Genetic Resources. Potato Variety Descriptors - Minimum List of Characteristics of Potato Varieties (*Solanum tuberosum*). Rome: IBPGR; 1985.
12. Kumar S, Bandyopadhyay N, Saxena S, Hajare SN, More V, Tripathi J, *et al.* Differential gene expression in irradiated potato tubers contributed to sprout inhibition and quality retention during a commercial scale storage. Scientific Reports. 2024; 14(1): 13484.
13. Lohani UC, Goraya RK, Ramalingam S, Senthilkumar T, Singh CB. Potato post-dormancy sprouting: A problem during storage and its control by essential oils as alternatives to artifact chemicals - A review. Journal of the Science of

- Food and Agriculture. 2025; 105(15): 8330-8345.
14. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. 4th ed. New Delhi: Indian Council of Agricultural Research; 2000. p. 157-165.
 15. Suttle JC. Physiological regulation of potato tuber dormancy. American Journal of Potato Research. 2004; 81(4): 253-262.
 16. Tatarowska B, Milczarek D, Plich J. The content of total carotenoids, vitamin C and antioxidant properties of 65 potato cultivars characterised under the European project ECOBREED. International Journal of Molecular Sciences. 2023; 24(14): 11716.
 17. Wooster P, Farooq K. National Program of Germplasm Screening, General Instructions for Trial and Guide to Data Collection. Islamabad: Pak-Swiss Potato Development Project, PARC; 1995. p. 24.

All authors' names and affiliations

Hemant Kumar Meena

Ph.D. (Research Scholar) Vegetable Science, Department of Vegetable Science, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Murlidhar J Sadawarti

ICAR-Central Potato Research Institute, Regional Station, Gwalior, Madhya Pradesh, India

KV Singh

Senior Scientist, (Vegetable Science), KVK Lahar, Bhind, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Deepanshi Deora

Ph.D. (Research Scholar) Vegetable Science, Department of Vegetable Science, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Vinod Kumar

ICAR-Central Potato Research Institute, Shimla, Himachal Pradesh, India

Nilesh Ninama

Ph.D. (Research Scholar) Vegetable Science, Department of Vegetable Science, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Tanuja Buckseth

ICAR-Central Potato Research Institute, Shimla, Himachal Pradesh, India

Subhash Katare

ICAR-Central Potato Research Institute, Regional Station, Gwalior, Madhya Pradesh, India

Rajendra Kumar Samadhiya

ICAR-Central Potato Research Institute, Regional Station, Gwalior, Madhya Pradesh, India

SP Singh

ICAR-Central Potato Research Institute, Regional Station, Patna, Bihar, India

Dharmendra Verma

ICAR-Central Potato Research Institute, Shimla, Himachal Pradesh, India

Ramawatar Choudhary

Ph.D. (Research Scholar) Department of Fruit Science, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Astha

Ph.D. (Research Scholar) Department of Fruit Science, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Abhishek Yadav

Ph.D. (Research Scholar) Vegetable Science, Department of Vegetable Science, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Umesh Patle

Ph.D. (Research Scholar) Agronomy, Department of Agronomy, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India