



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(9): 801-804
Received: 24-07-2026
Accepted: 28-08-2026

Abhishek Yadav
Ph.D. (Research Scholar), Department of
Horticulture, College of Agriculture,
RVSKVV, Gwalior, Madhya Pradesh, India

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

RK Jaiswal
Department of Horticulture, RVSKVV,
Gwalior, Madhya Pradesh, India

IS Naruka
Department of Horticulture, RVSKVV,
Gwalior, Madhya Pradesh, India

Vinod Kumar
ICAR-Central Potato Research Institute,
Shimla, Himachal 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

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

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

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

PKS Gurjar
Department of Horticulture, RVSKVV,
Gwalior, Madhya Pradesh, India

Manisha Pathak
Ph.D. (Research Scholar), Department of
Horticulture, College of Agriculture,
RVSKVV, Gwalior, Madhya Pradesh, India

Hemant Kumar Meena
Ph.D. (Research Scholar), Department of
Horticulture, College of Agriculture,
RVSKVV, Gwalior, Madhya Pradesh, India

Corresponding Author:
Murlidhar J Sadawarti
ICAR-Central Potato Research, Institute
Regional Station, Gwalior, Madhya Pradesh,
India

Evaluation of potato (*Solanum tuberosum* L.) varieties under nucleus seed production system for growth, yield and seed multiplication parameters

Abhishek Yadav, Murlidhar J Sadawarti, RK Jaiswal, IS Naruka, Vinod Kumar, Tanuja Buckseth, Subhash Katare, SP Singh, Sanjay Kumar Sharma, RK Samadhiya, PKS Gurjar, Manisha Pathak and Hemant Kumar Meena

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9k.6608>

Abstract

A field experiment was conducted in the experimental area of the ICAR-Central Potato Research Institute (Regional Station), Gwalior, Madhya Pradesh, during two *rabi* seasons, 2024-25 and 2025-26, under the agro-climatic and soil conditions of Madhya Pradesh to evaluate potato varieties for growth, yield and seed multiplication parameters under nucleus seed production system, where the seed tuber weight per plot ranged from 1491.3 to 2192.3 gram for different varieties. K. Khyati variety recorded early initial emergence (6.5 days). K. Pukhraj (8.5 days) recorded lowest days to 50% plant emergence. The minimum emergence noticed in K. Sangam (95.83%), followed by K. Sindhuri (97.22%) and K. Lauvkar (98.61%). Rest of varieties showed 100% of plant emergence. In yield and seed multiplication parameters, variety K. Sindhuri (36.4 tubers) recorded maximum total number of tubers per plant. The total weight of tubers kg per plant was recorded highest in variety K. Surya (2.03 kg per plant). The mean tuber weight found highest in K. Surya (96.0 g) variety. The maximum seed multiplication rate by number noticed in the K. Sindhuri (36.4). While the maximum seed multiplication rate by weight found in K. Pukhraj (13.3).

Keywords: Potato, varieties, Growth, seed multiplication rate, yield, nucleus seed production system

1. 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. Generally, tubers are used as seed in potato (*Solanum tuberosum* L.) which contribute to 40-50% of input cost, overwhelming various problems like low multiplication rates, increased production cost, various seed borne diseases befitting the risk of degeneration over the years. Such tubers when planted yields low and diseased plants in future generations. The seed related issues are further aggravated because of restricted accessibility of reasonable seed producing regions. Quality seeds can alone add to the increased yield by 15–20%.

India is the second largest producer of potato next to China. The major potato producing states are Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh, Punjab, Haryana, Assam, Jharkhand and Chhattisgarh. In India, the area, production and productivity of potato are 2.3 million hectare, 58.57 million tons and 24.72 tons/ha respectively. In Madhya Pradesh, the area, production and productivity of potato are 169.72 thousand hectare, 3897.63 thousand ton and 22.96 ton per hectare respectively (Anonymous, 2024) [2].

The quality of seeds is considered an important factor for increasing yield and helps greatly in higher production per unit area to attain food security of the country. Quality seeds have the ability for efficient utilization of the inputs such as fertilizers and irrigation. Like other crops, high yields of potato revolves around use of high-quality seed potatoes. Seed production is very technical aspect and needs careful attention during all stages like date of planting, spacing, fertilization, top-dressing, irrigation, rouging, weeding, earthing up, spraying, harvesting (dehauling and

harvesting) and storage should be carefully carried out as per standard seed plot technique. The seed related issues are further intensified due to restricted accessibility to seed producing regions, difficulties in the production and distribution of disease free seeds, transportability of quality seeds and inadequacies of cold storage facilities resulting in rotting and sprouting. Since potato is a vegetatively propagated plant, fungal, bacterial and especially viral diseases easily affect seed tubers. It gets degenerated very fast necessitating replacement after every four years. Additionally, the seed is either unavailable or out of the reach of poor farmers owing to high seed cost. Breeder seed in potato produced from nucleus seed. The nucleus seed is developed in the hills produced during long day conditions at a temperature range of 12-28 °C and 8-28 °C in plains. The nucleus seed can be developed through clonal selection and tuber indexing and after ELISA testing for viruses, diseases free tubers are multiplied in the field in stage-I at a spacing of 1 x 1 m in hills and 1.2 x 1.0 m in the plains. The produce of stage-I is further multiplied in stage-II at a spacing of 1.0 x 0.2 and 1.2 x 0.2 m in hills and plains respectively. The seed produced in these stages is called nucleus seed.

2. Materials and Methods

During two consecutive rabi seasons (2024-25 and 2025-26), an experiment was conducted at Central Potato Research Institute – Regional Station (CPRI-RS), experimental area of ICAR field, Gwalior, Madhya Pradesh. The experiment was laid out with 3 replications comprised of 33 total plots in Randomized Block Design. Where the treatments included different popular and new varieties of potato in a randomized block design (RBD) with 11 treatments viz. T₁- Kufri Chandramukhi, T₂- Kufri Jyoti, T₃- Kufri Sindhuri, T₄- Kufri Lauvkar, T₅- Kufri Chipsona -1, T₆- Kufri Chipsona -3, T₇- Kufri Surya, T₈- Kufri Pukhraj, T₉- Kufri Khyati, T₁₀- Kufri Bahar, T₁₁- Kufri Sangam.

The planting of seed tubers was done in the last week of October. Where the healthy, uniform, large sized indexed tubers with average weight of 100-150 gram were used. 12 plants were planted in each plot at a spacing of 1.2 m row to row and 1 m plant to plant. Standard recommended package of practices (Seed Plot technique) was followed to raise a healthy crop. Nitrogen, phosphorus and potassium were applied, through ammonium sulphate and urea, single super phosphate and muriate of potash respectively. A uniform dose of 180 kg N ha⁻¹, 80 kg P ha⁻¹ and 120 kg K ha⁻¹ was applied to all the plots. Plant protection measures for diseases and vector management is one of the important operations for achieving optimum yield in potato. Haulm uprooting of potato crop was done manually at 75 days after planting and tuber digging was done after 10-12 days after haulm uprooting by using spade, manually. Observation of the growth parameter viz. seed (tuber) weight per plot (g/plot), days to emergence, days to 50% plant emergence and final emergence% at 30 days after planting recorded during the crop season. The data on yield and seed multiplication parameters viz. total number and weight (gram) of tubers per plant, mean tuber weight in gram (weight of tubers from the plant divided by total number of tubers from the plant), seed multiplication rate by number (the number of tubers produced from a tuber planted), seed multiplication rate by weight (total weight of tubers produced from a plant and it was divided by weight of seed tuber planted) was taken at the time of harvesting of each plant.

3. Results and Discussion

The observations were recorded on various growth, yield and seed multiplication parameters of potato. The data was subjected to

statistical analysis and is being briefly discussed and presented in tables -1.

3.1 Growth parameters

The seed tuber weight per plot influenced by different varieties ranged from 1491.3 to 2192.3 gram per plot. Where the maximum seed tuber weight recorded in variety K. Surya (2192.3 gram) variety. It was followed by variety K. Khyati (2096.5 gram) and K. Bahar (2077.7 gram). While minimum seed tuber weight was observed in K. Chipsona – 1 (1491.3 gram). The variation in seed weight among different genotypes may be due to differences in genetic constitution and tuber size potential under prevailing agro-climatic conditions. Similar variation in seed tuber weight among potato genotypes was reported by Tessema *et al.* (2022) [20] who observed significant genetic variability for yield traits including tuber weight. Similar findings reported by Bist *et al.* (2023) [3] and Ebrahim *et al.* (2018) [7]

There was significant variation with regard to days to plant emergence, where the K. Khyati variety was early to initial plant emergence (6.5 days), followed by K. Pukhraj (6.8 days), K. Chipsona-3 (7 days). Whereas the K. Sindhuri and K. Surya was observed late plant initial emergence with 9.2 days. Ebrahim *et al.* (2018) [7] observed that larger seed tubers took the shorter time to emerge as compared to the smaller seed tubers. This may be due to the fact that large tubers had sufficiently more stored reserve food compared to smaller seed tubers to provide an optimal supply of carbohydrate for the emerging seedling of the larger tuber and while Pandey *et al.* (2023) [15] reported that the variation in emergence may be attributed to differences in genetic constitution, sprouting behaviour and physiological vigour of seed tubers. Similar genotypic differences in emergence behaviour have been confirmed by Sadawarti *et al.* (2014) [18], Chaudhary *et al.* (2025) [4].

The different varieties of potato recorded significant variation for days to 50% plant emergence. The K. Pukhraj (8.5 days) variety recorded lowest days to 50% plant emergence followed by K. Chipsona – 1 and K. Khyati (8.8 days in both). While the variety K. Sangam (11.3 days) was showed highest days for 50% plant emergence. The variation in emergence among potato varieties and planting dates can be due to genetic traits and environmental factors. Given that potato is a short-duration crop and day length is critical for tuberization, understanding the bulking behavior of these varieties is essential. This is in concurrence with reports by Ebrahim *et al.* (2018) [7], A similar trend was also reported by Kumar *et al.* (2022) [12].

Final germination (%) after 30 days of planting revealed that varieties did not differ significantly. The different potato varieties showed a variation in plant emergence wherein minimum emergence noticed in K. Sangam (95.83%), followed by K. Sindhuri (97.22%) and K. Lauvkar (98.61%). Although other all varieties showed 100% of plant emergence. The better performance of these varieties might be due to their genetic make-up and their better adaptability to prevailing environmental conditions (Gohain *et al.* 2025) [9]. Present results are in accordance with Preetham *et al.* (2018) [17], also Sadawarti *et al.* (2018) [19] who concluded that variation in the varietal emergence is due to genetic structure of variety and sprouting ability of tubers. Sadawarti *et al.* (2014) [18], Nagar *et al.* (2019) [14], Pandey *et al.* (2023) [15], Chaudhary *et al.* (2025) [4] and Patel *et al.* (2024) [16] also noted non-significant differences in the final emergence percentage among varieties.

3.2 Yield and seed multiplication parameters

The total number of tubers per plant differed significantly among

different varieties of potato, where the variety K. Sindhuri (36.4 tubers) recorded maximum total number of tubers per plant followed by variety K. Chipsona – 3 (29.6 tubers) and K. Khyati (27.7 tubers). While the minimum total number of tubers per plant was recorded from variety K. Lauvkar (17.5 tubers). The increase in number of tubers per plant has been attributed to the maximum increase in growth parameters. While it can differ from one cultivar to another, having more stems per plant also contributes to an increased quantity of tubers for each plant increasing yield (Gohain *et al.* 2025, Kumar *et al.*, 2022, Chaudhary *et al.*, 2025 and Tripathi *et al.*, 2026) [4, 9, 12, 21]

The total weight of tubers per plant (gram) differed significantly among different varieties of potato and maximum total weight of tubers per plant (gram) was recorded in variety K. Surya (2032.5 gram) followed by variety K. Pukhraj (1905.8 gram) and K. Bahar (1673.7 gram). Whereas the minimum total weight of tuber per plant (gram) was noted in variety K. Sangam (1194.4 gram). The production or yield is an ultimate result of the plants which depends on the genetic constitution of the plant and environmental factors which consists of different weather components and soil characteristics. Similar tendencies were obtained by Kumar *et al.* (2022) [12], Chaudhary *et al.* (2025) [4], Karada *et al.* (2025) [10], Gohain *et al.* (2025) [9] and Tripathi *et al.* (2026) [21].

Mean tuber weight (g) differed significantly among different varieties of potato. K. Surya variety recorded with highest mean tuber weight with 96.0 g followed by K. Bahar (88.8 g) and K. Lauvkar (83.6 g). While the K. Sindhuri variety found lowest mean tuber weight of 41.5 g. The differences in average tuber

weight can also be attributed to the distinct genetic traits of each variety. The findings of this study are consistent with the research conducted by Gohain *et al.* (2025) [9], which highlights the significant variations in average tuber weight among different potato varieties. The present study is supported by the findings of Wrobel (2014) [24], Elsagan (2020) [8], Karada *et al.* (2025) [10], Abebe and Geleta (2025) [1].

Seed multiplication rate by number influenced by different varieties with significant differences. The maximum seed multiplication rate noticed in the K. Sindhuri (36.4) variety followed by K. Chipsona – 3 (29.6), K. Khyati (27.7) and K. Chipsona – 1 (27.4). While the minimum number of seed multiplication rate was observed in K. Lauvkar (17.5). The probable reason for enhanced tubers per plant may be due to better germination, genetic makeup, and environmental interactions. Similar tendencies were obtained by Chindi *et al.* (2013) [5], Virmond *et al.* (2017) [23], Dimante and Gaile (2015) [6] and Abebe and Geleta (2025) [1].

The seed multiplication rate by weight influenced by different varieties and maximum seed multiplication rate by weight found in variety K. Pukhraj (13.3) followed by K. Sindhuri (12.2) and K. Chipsona – 1 (12). While minimum seed multiplication rate by weight found in variety K. Sangam (7.7). Choudhary reported that the cumulative positive effect of growth parameters and yield-attributing characters was finally reflected on seed multiplication rate of potato. These findings are in agreement with Dimante and Gaile (2015) [6], Meka *et al.* (2018) [13] and Abebe and Geleta (2025) [1].

Table 1: Germination, yield and Seed multiplication parameters for popular and new varieties of potato under nucleus seed production system

Treatment	Seed tuber weight (g/plot)	Days to initial emergence	Days to 50% emergence	Final emergence% at 30 DAP	Total number of tubers per plant	Total weight of tubers kg per plant	Mean tuber weight (g)	Seed multiplication rate number	Seed multiplication rate weight
K. Chandramukhi	1600.7	7.5	10.8	100.0	21.1	1496.3	71.8	21.1	10.5
K. Jyoti	1614.3	7.5	9.8	100.0	21.4	1432.6	67.5	21.4	10.7
K. Sindhuri	1571.7	9.2	11.2	97.2	36.4	1500.2	41.3	36.4	12.2
K. Lauvkar	1871.3	8.0	10.2	98.6	17.5	1451.4	83.6	17.5	9.5
K. Chipsona -1	1491.3	7.3	8.8	100.0	27.4	1518.1	55.4	27.4	12.0
K. Chipsona -3	1827.7	7.0	9.2	100.0	29.6	1544.9	52.3	29.6	10.4
K. Surya	2192.3	9.2	10.5	100.0	21.2	2032.5	96.0	21.2	11.1
K. Pukhraj	1863.7	6.8	8.5	100.0	26.3	1905.8	72.7	26.3	13.3
K. Khyati	2096.5	6.5	8.8	100.0	27.7	1652.6	59.8	27.7	10.0
K. Bahar	2077.7	7.7	9.7	100.0	19.0	1673.7	88.8	19.0	10.0
K. Sangam	1885.0	8.7	11.3	95.8	19.6	1194.4	62.1	19.6	7.7
S.Em. ±	69.52	0.32	0.32	0.93	0.75	26.61	1.77	0.75	0.47
C.D. at 5%	198.72	0.92	0.92	2.65	2.16	76.06	5.05	2.16	1.35

4. Conclusion

In the growth parameters the seed tuber weight per plot ranged from 1491.3 to 2192.3 gram per plot for different varieties. K. Khyati variety recorded early emergence (6.5 days). K. Pukhraj (8.5 days) recorded lowest days to 50% plant emergence. The minimum emergence noticed in K. Sangam (95.83%), followed by K. Sindhuri (97.22%) and K. Lauvkar (98.61%). Although other all varieties showed 100% of plant emergence. In yield and seed multiplication parameters, variety K. Sindhuri (36.4 tubers) recorded maximum total number of tubers per plant. The total weight of tubers kg per plant was recorded highest in variety K. Surya (2.03 kg per plant). The mean tuber weight found highest in K. Surya (96.0 g) variety. The maximum seed multiplication rate by number noticed in the K. Sindhuri (36.4). While the maximum seed multiplication rate by weight found in K. Pukhraj (13.3).

References

1. Abebe BT, Geleta GM. Potato (*Solanum tuberosum* L.) growth and yield response to inflorescence removal and seed tuber size in Girar Jarso District, Central Ethiopia. 2025;6:125-132.
2. Anonymous. Area and production of horticulture crops for 2024-25: final estimates. New Delhi: Ministry of Agriculture and Farmers Welfare; 2024.
3. Bist DS, Adhikari P, Bhattarai S. Effect of seed tuber size on growth and yield of potato (*Solanum tuberosum* L.) variety 'Desiree'. Int J Appl Res. 2023;6(2):110-123.
4. Chaudhary B, Luthra SK, Gupta VK, Bhatnagar A, Kumar V. Evaluation of potato germplasm in Northern Plains of India. Potato J. 2025;52(1):64.
5. Chindi A, Woldegiorgis G, Solomon A, Tesema L, Negash K, Lemaga B, *et al.* Enhancing potato seed production using

- rapid multiplication techniques. 2013.
6. Dimante I, Gaile Z. The effect of planting density on potato (*Solanum tuberosum* L.) minituber number, weight and multiplication rate. 2015. p.27-33.
 7. Ebrahim S, Mohammed H, Ayalew T. Effects of seed tuber size on growth and yield performance of potato (*Solanum tuberosum* L.) varieties under field conditions. *Afr J Agric Res*. 2018;13(39):2077-2086.
 8. Elsagan MAM. Evaluation of some potato cultivars productivity by using seedling. *Middle East J Agric Res*. 2020;9(4):758-771.
 9. Gohain T, Kehokhunu RS, Goud AS. A study on growth, yield, and quality traits of potato (*Solanum tuberosum* L.) varieties under the agro-climatic conditions of Nagaland, India. *Environ Ecol*. 2025;43(4):1005-1010.
 10. Karada MS, Kumar A, Mishra R, Singh BK, Singh AK, Agnihotri D, *et al*. Evaluation of varietal and location effects on growth, yield and economics of potato (*Solanum tuberosum* L.) in Eastern Uttar Pradesh, India. *J Exp Agric Int*. 2025;47(10):390-397.
 11. Kavar A, Sharma R, Regmi BR, Ghimire N. Planting date and varietal impact on growth and yield of potato. *Genet Plant Breed Seed Sci*. 2025;1(1):15-24.
 12. Kumar H, Sadawarti MJ, Bajpai R, Singh SP, Samadhiya RK, Lekhi R, *et al*. Performance of medium duration potato hybrids and varieties for morphology, growth and yield characters under Chambal region of Madhya Pradesh. *Biol Forum Int J*. 2022;14(4):1267-1273.
 13. Meka SS, Njualet DK, Nchang M. Seed tubers yield performance of some potato varieties in different localities of the Western Highlands of Cameroon. *J Appl Life Sci Int*. 2018;16(4):1-5.
 14. Nagar BL, Yadav DL, Baldev R, Narolia RS. Performance of potato varieties for growth, yield and yield attributing in South Eastern Rajasthan. *J Exp Bio Agric Sci*. 2019;7(5):438-441.
 15. Pandey P, Arya S, Kadian MS, Rani D, Yadav SK. Performance of CIP potato (*Solanum tuberosum*) clones for early maturity in subtropical region of Haryana. *Indian J Agric Sci*. 2023;93(3):336-338.
 16. Patel JK, Patel RN, Zapadiya DM, Vaghela SJ. Degeneration of potato varieties due to virus incidence in North Gujarat. *Potato J*. 2024;51(2):200.
 17. Preetham A, Ashwini R, Pavan B. Evaluation of potato varieties for their suitability under northern Telangana agro-climatic conditions. *Int J Curr Microbiol Appl Sci*. 2018;7(4):400-406.
 18. Sadawarti MJ, Bhatnagar A, Singh SP, Pandey KK. Prospect of early planting of potato seed crop in Central India. *Indian J Hill Farming*. 2014;27(1):12-16.
 19. Sadawarti M, Patel K, Samadhiya RK, Gupta PK, Singh SP, Gupta VK, *et al*. Evaluation of table and processing varieties of potato (*Solanum tuberosum* L.) for North-Central India. *Int J Chem Stud*. 2018;6(4):823-833.
 20. Tessema GL, Gebeyehu S, Gebremariam A. Genetic variability, heritability and correlation of tuber yield and yield-related traits in potato (*Solanum tuberosum* L.). *BMC Genet*. 2022;23:936.
 21. Tripathi S, Singh HB, Mishra SR, Singh AK, Chihui YA, Kumar S, *et al*. Performance of potato cultivars: assessment of growth and yield under varying sowing dates in Eastern Uttar Pradesh, India. *J Biol Nat*. 2026;18(1):319-330.
 22. Tsagaye D, Fikre D, Fufa N, Gebretensay F, Ali A, Wegayehu G. Agronomic evaluation of potato (*Solanum tuberosum* L.) genotypes for tuber yield and yield attributing traits. *Int J Bio-resource Stress Manag*. 2023;14(5):719-725.
 23. Virmond EP, Kawakami J, Souza-Dias JA. Seed-potato production through sprouts and field multiplication and cultivar performance in organic system. *Hortic Bras*. 2017;35(3):335-342.
 24. Wróbel S. Assessment of possibilities of microtuber and *in vitro* plantlet seed multiplication in field conditions. Part 1: PVY, PVM and PLRV spreading. *Am J Potato Res*. 2014;91(5):554-565.